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ARCHEOLOGICAL RESEARCH SERIES NUMBER SEVEN-D

Wetherill Mesa Excavations

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Mesa Verde National Park — Colorado

by Arthur H. Rohn

NATIONAL PARK SERVICE • U.S. DEPARTMENT OF THE INTERIOR
WASHINGTON 1971

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foreword

Since 1916, the National Park Service has concerned itself with the preservation and interpretation of notable works of nature and of significant works of man, both historic and prehistoric, in the United States. Mesa Verde National Park, in southwestern Colorado, contains a vast array of prehistoric ruins in a virtually unspoiled natural setting. I invite your attention to this report and to forthcoming publications that have emanated from scientific researches conducted by the Park Service, in conjunction with the National Geographic Society, in a section of the park known as Wetherill Mesa. These studies reveal man in congenial relationship with his (austere) environment. It is mandatory that we adopt a comparable ecological approach to life if we are to continue to inhabit this planet.

Rogers CB Morton
ROGERS C. B. MORTON
Secretary of the Interior

From 1959 through 1963, the National Park Service, with generous support from the National Geographic Society, carried out a comprehensive field study of the archeology and ecology of Wetherill Mesa, in Mesa Verde National Park. Wetherill Mesa is being developed so that increasing numbers of visitors will be able to observe the evolution of a prehistoric culture, both here and in the nearby and more familiar section of the park known as Chapin Mesa.

It is a pleasure to present the fourth monograph of the Wetherill Mesa Project in the Archeological Research Series. This report recreates, in all possible detail, the life of a southwestern Indian community of some 700 years ago. Additional monographs to be published in the series will deal with other Wetherill Mesa sites, as well as with various aspects of the ecology and archeology of the area.

GEORGE B. HARTZOG, JR., *Director*
National Park Service

acknowledgments

To transform the mass of debris of a former habitation site into an episode in human history is a primary goal of archeological investigation. We can obtain only an incomplete picture, however, since we are dealing with fragmentary remains of human lives. Even though an excavated site is preserved as a permanent exhibit, as is Mug House, and the objects recovered from it are placed in a museum, the work is not complete until the archeologist has published his report.

An archeological site report should go beyond a mere inventory of the physical finds, leaving all interpretation to the reader. No one knows the site as well as the archeologist who excavated it, and he should attempt to reconstruct the life of the people who occupied the site and the uses to which they put certain tools and utensils. This reconstruction should not, of course, gloss over the basic data, which must be described as completely and precisely as possible.

My approach to archeological reporting has been expressed by Steward and Setzler (1938, p. 8):

> We believe that treatment of archaeological objects would be more meaningful if they were regarded not simply as museum specimens but as tools employed by human beings in some pattern of behavior. This requires a deliberate effort to understand their functional place in the total configuration of activity. Naturally, it is more difficult in archaeology than in ethnology to ascertain the function of each implement. The purpose of some we cannot know at all; others may be known only imperfectly. Nevertheless, each had some function.

The preparation of Mug House as an outdoor exhibit-in-place and the study of the materials recovered from it have involved the efforts and cooperation of many individuals. Foremost among them is James A. Lancaster, who provided general supervision for the excavation and stabilization at Mug House and at the other sites investigated on Wetherill Mesa. Al shared with me his remarkable insight into Pueblo prehistory and inspired many of the ideas presented here.

The regular excavation-stabilization crew consisted of George King, Frank Bluehorse, J. Lester Goff, Eugene Tapahonso, H. Anthony Ruckel, Kee Nez, David A. Hannah, Gordon Lalander, Richard Ellis, William Burnett, Billy D. Watson, Virgil Higgins, Arthur Loy, and Raymond Adkins. To list all others who worked in Mug House at one time or another would be impractical. Nonetheless, their contributions are acknowledged.

Logistical support for the field and laboratory work was furnished by the camp crew, the administrative personnel of the Wetherill Mesa Project, and the staff of Mesa Verde National Park, under the direction of Superintendent Chester A. Thomas.

Field mapping was done mostly by James E. Pond. Lewis D. Anderson, park engineer, made the sections and prepared initial drafts of the larger maps. Final renderings of all maps were done by George A. King, architect, Durango, Colo.

Although all the museum assistants worked at various times on Mug House materials, those who did so most consistently were Jean Lee, Sue Waite, Ruth Chappell, and Gisele Eberling.

Through the assistance of the National Geographic Society, we were able to enlist the aid of specialists in identifying or analyzing many of the items we found in Mug House. The human bones were studied by physical anthropologists Charles Merbs and Kenneth A. Bennett, working under Frederick S. Hulse of the University of Arizona. James S. Miles, M.D., of the University of Colorado Medical Center, examined the skeletons for signs of osteopathology, and E. H. Hixon, D.D.S., of the University of Oregon Dental School, sought similar evidence in the teeth. One skeleton was sent to Ellis R. Kerley, of the Armed Forces Institute of Pathology, for evaluation of the possibilities that syphilis had been present. No evidence of this affliction was found.

Mammal bones were identified by Thomas W. Mathews, of the National Park Service's Southwest Archeological Center, Globe, Ariz. Lyndon L. Hargrave, a collaborator with the National Park Service, identified all the bird bones. Norman Messinger of the National

Park Service identified feathers. The late Olaus J. Murie, of Moose, Wyo., gave us identifications of the scats. Human and turkey feces were examined for evidence of endoparasites by Robert Samuels, of Meharry Medical College, Nashville, and were analyzed spectographically for trace elements by Bruno E. Sabels, then of the University of California at Los Angeles and now of Isotopes, Inc. Some of these feces were washed and screened by Marilyn Colyer of the project staff for a diet study. The Federal Bureau of Investigation and Charles L. Douglas, animal ecologist with the Wetherill Mesa Project, identified some of the hair and hides.

Remains of wild plants recovered from the excavations and washed from feces were identified by Stanley L. Welsh, Brigham Young University, and James A. Erdman, plant ecologist, of the project staff. Cultivated corn and squash specimens were studied by Hugh C. Cutler and associates at the Missouri Botanical Garden, St. Louis, and the beans were examined by Lawrence Kaplan, University of Massachusetts, Boston.

Pollen studies were conducted by William Byers and Douglas K. Warren, under the supervision of Paul S. Martin, at the Geochronology Laboratories, University of Arizona. Robert F. Nichols, of the project staff, obtained tree-ring dates under the guidance of Bryant Bannister, Laboratory of Tree-Ring Research, University of Arizona.

Entomological research was carried on by Samuel A. Graham, University of Michigan. Orville A. Parsons, Soil Conservation Service of the U.S. Department of Agriculture, provided information on soils both within the site and around it. Charles B. Hunt of the Geological Survey, U.S. Department of the Interior, identified rock and mineral specimens. Robert J. Drake, University of British Columbia, Vancouver, identified fossil and nonfossil molluscan remains.

Richard H. Brooks, University of Colorado, analyzed some of the Mug House midden deposits. Unfortunately, the nature of the deposits precluded any real measure of success in this undertaking.

Though all staff members of the Wetherill Mesa Project contributed their time and ideas during the laboratory study and the writing of the report, several should be specifically mentioned. Charles Douglas and James Erdman acted as useful references on biological and ecological interpretations. Carolyn M. Osborne contributed her knowledge and experience in a joint analysis of the perishable artifacts. The stone and bone artifacts were studied jointly with Richard P. Wheeler, who also provided stimulation and encouragement for a large part of the whole work. Bernard S. Katz offered sage editorial advice all along the way. Douglas Osborne organized and administered the project and coordinated the operations of the many specialists working with Mug House materials.

Fred E. Mang, Jr., project photographer, took most of the photographs and did all the darkroom processing for this report. He also devised the more interesting compositions. Several line drawings were made by Marilyn Colyer.

References are made in this report to materials from three sites on Wetherill Mesa which were excavated by the project and which will be published in due time. These sites are the cliff ruin, Long House (George S. Cattanach, Jr.), and two open sites, Two Raven House and Site 1230 (Jervis D. Swannack, Jr.).

This publication is Contribution 35 of the Wetherill Mesa Project.

A. H. R.

February 1966

contents

CHAPTER 1 HISTORY OF MUG HOUSE 1
  The Setting 2
  Previous Work 6
  The Wetherill Mesa Project 6
  Archeological Sequence 17
  Construction Sequence 26
  Abandonment 26
CHAPTER 2 HOUSE AND VILLAGE ARRANGEMENT 31
  Suites (Household Units) 31
  Courtyard Units 37
  Dual Division 39
  The Community 40
  Summary 41
CHAPTER 3 ARCHITECTURE: LIVING AND STORAGE QUARTERS 43
  Rooms 43
  Domestic Features 50
  Additional Room Notes 60
  Areas 61
  Courtyards 62
  Other Features 62
  Mug House Reservoir (Site 1586) 64
CHAPTER 4 ARCHITECTURE: KIVAS AND TOWERS 67
  Kivas 67
  Kihu (Room 9) 84
  Towers 86
CHAPTER 5 BURIALS 87
CHAPTER 6 ECONOMY 97
  Human Feces 97
  Cultivated Plant Remains 97
  Fields 99
  Agricultural Equipment 100
  Storage 101
  Pests 101
  Mammal and Bird Bones 101
  Domesticated Animals 106
  Hunting Equipment 106
  Wooden Club or Digging Stick 109

CHAPTER 7 CLOTHING AND ADORNMENT 111
- Footwear 111
- Robes or Blankets 113
- Yucca Cordage 114
- Cotton Cloth 120
- Cotton Yarn 121
- Human Hair Cordage 122
- Animal Skins and Sinew 124
- Ornaments 126
- Paint 128

CHAPTER 8 UTENSILS 131
- Pottery Vessels 131
- Potsherds 189
- Baskets 192
- Pot Rests 194
- Pot Covers 196

CHAPTER 9 TOOL KIT 201
- Grinding Tools 201
- Polishing and Rubbing Tools 209
- Pounding Tools 209
- Chopping Tools 212
- Cutting Tools 216
- Scraping Tools 219
- Perforating Tools 222
- Weaving Tools 226
- Composite Tools 229
- Miscellaneous Tools 229

CHAPTER 10 HOUSEHOLD EQUIPMENT 231
- Mats and Matting 231
- Cradle 233
- Wooden Pillow 234
- Fire-making Equipment 234
- Wooden Stirring Paddle 234
- Wooden Pokers 234
- Worked Sandstone Slabs 235
- Tumpline Headbands 235
- Yucca Strips and Knots 237

CHAPTER 11 MISCELLANEOUS OBJECTS 241
- Probable Ceremonial Paraphernalia 241
- Probable Toys and Gaming Objects 245
- Objects of Unknown Purpose 246

CHAPTER 12 INTERPRETATIONS 255
- Reconstruction of 13th-Century Environment 255
- Utilization of the Environment 257
- Trade 260
- Untapped Resources 261
- Reconstruction of Life in Mug House 261
- Cultural Changes 263

REFERENCES 265

APPENDIX: ROOM DESCRIPTIONS 268

INDEX 277

illustrations

1. Four Corners area. 2
2. Western part of the Mesa Verde. 3
3. Mug House alcove and Adobe Cave. 4
4. Stripping trash slope. 7
5. Equipment for lowering materials. 8
6. A-frame and tube chute. 8
7. Mug House (Site 1229), before excavation and after excavation and stabilization. 9
8. South part of Mug House. 10
9. Lower cave of Mug House. 11
10. Courtyards C, D, and G. 12
11. North part of Mug House. 13
12. Kiva B and adjacent rooms. 14
13. Crack in sandstone roof above upper ledge. 15
14. Removing separated sandstone slab. 15
15. Map of the Mug House trash slope. 16
16. Schematic profile of the Mug House trash slope. 17
17. Plan of slab cist on banquette of Component A kiva, Mug House. 18
18. Site 1227, showing area where structures were razed. 21
19. Painting on back wall, Site 1227. 22
20. Adobe deposit in Adobe Cave (Site 1228). 22
21. Adobe Cave. 23
22. Rooms 1 and 2, Adobe Cave. 24
23. Lower cave and upper ledge of Mug House. 28
24. Profiles of Mug House. 32
25. Suite 1. 32
26. Suite 10/1. 33
27. Suite 12/1. 33
28. Suite 19. 34
29. Suite 11/2. 34
30. Suite 71. 34
31. Suite 26. 34
32. Suite 30/1. 35
33. Suite 36/1. 35
34. Artist's reconstruction of Suite 37/1. 35
35. Suite 42/1. 36
36. Suite 45/2. 36
37. Suite 46/2. 36
38. Early Courtyard Unit B. 38
39. Early Courtyard Unit D. 39
40. Mug House locality. 41
41. Pecked and ground stones in masonry wall, with spalls used for chinking. 44
42. Single-coursed (simple) wall construction with white plaster on exterior. 45
43. Double-coursed (compound) wall construction. 45
44. Stone veneer "peeling off" interior masonry walls. 46
45. Footing of rough stones under double-coursed wall. 46
46. Adobe quarry at rear of Adobe Cave. 47
47. Puddling basins near adobe quarry, Adobe Cave. 47
48. Red sandstone spalls, Room 25. 48
49. In-place roof beams and monochrome plaster, Room 45. 49
50. Roof-beam seats cut into existing walls. 49
51. Large T-shaped doorway. 51
52. Rectangular doorways. 52
53. Wooden lintel. 52
54. Oak loops around doorway. 53
55. Stick across top of doorway. 53
56. Mud-covered frame in doorway. 53
57. Stone door slab. 53
58. Masonry shelf. 54
59. Suspension pole. 55
60. Wall pegs. 56
61. Wall loops found in rubble. 56
62. Possible balcony support timber. 57
63. Corner hearth. 58
64. D-shaped hearth. 58
65. Sandstone concretions, probably used as pot supports. 59

66. Various in-place items, Room 71. 61
67. Mud collar around storage jar. 62
68. Ladder grooves in face of upper ledge. 62
69. Steps pecked in sandstone boulder near south tower (Room 76). 63
70. Stone masonry steps leading to trash slope in north part of Mug House. 63
71. Stone wall of dam, Mug House reservoir (Site 1586). 64
72. Mug House reservoir, after excavation. 65
73. Pilaster construction in four kivas. 69
74. Interpilaster measurements in Kiva B. 70
75. Rendering of outermost painting on plaster wall, Kiva C. 71
76. White painted band and triangles on plaster wall, Kiva C. 71
77. Rendering of early wall painting, Kiva C. 71
78. Pot supports in kiva hearth. 73
79. Hearth with embedded pot supports, Kiva C. 73
80. Hearth with pot supports and slab fragment, Kiva D. 73
81. Jar-neck lining of sipapu, Kiva C. 74
82. Double rectangular and round niches, Kiva C. 75
83. Large niche, Kiva H. 75
84. Kiva A. 76
85. Kiva B. 76
86. Kiva C. 77
87. Tunnel in south side of recess, Kiva C. 77
88. Shallow basins in floor near southeast wall, Kiva C. 77
89. Kiva D. 78
90. Remains of grinding bin, Kiva D. 78
91. Objects on floor, Kiva D. 79
92. Kiva E. 80
93. Overall view of Kiva E, with banquette formed by shallow alcoves. 80
94. Kiva F. 81
95. Overall view of Kiva F, showing circular wall built inside earlier square chamber. 81
96. Kiva G. 82
97. Hearth, deflector, and ventilator, Kiva G. 82
98. Overall view of Kiva G, after excavation and stabilization.. 83
99. Kiva H. 84
100. Hearth, deflector, and ventilator, Kiva H. 84
101. Kihu (Room 9). 85
102. Sketch showing probable position of a weaver in kihu (Room 9). 86
103. Burial M21. 87
104. Burial M31. 89
105. Burial M34. 89
106. Burial M6. 90
107. Burial M27. 90
108. Burial M25. 91
109. Burial M5. 91
110. Burial M9. 91
111. Burial M43, in Adobe Cave. 91
112. Burial M30. 91
113. Burial M46, in Adobe Cave. 91
114. Grave offerings, Burial M31. 92
115. Grave offerings, Burial M6. 93
116. Artificial flattening of back of skull, Burial M27. 94
117. Decay, tartar, and attrition in maxillary teeth, Burial M43. 95
118. Caries and evidence of pyorrhea, Burial M46. 95
119. Impacted canines, Burial M43. 95
120. Various remains of corn plants. 96
121. Various remains of squash plants. 98
122. Remains of bean plants. 98
123. Air view of possible main farmlands for Mug House in middle distance. 99
124. Blade ends of digging sticks. 100
125. Digging-stick impressions in adobe quarry, Adobe Cave. 100
126. Fragments of bowstring. 107
127. Fragments of arrow shafts. 107
128. Stone arrow points. 108
129. Wooden club or digging stick. 109
130. Fragments of twilled yucca sandals. 111
131. Fragment of twined cord sandal. 112
132. Feather-cord sock on model's foot. 112
133. Feather-cloth blanket with Burial M2, Adobe Cave. 113
134. Fragment of feather cloth. 113
135. Types of yucca fiber used in cordage. 114
136. Varities of 2-ply Z-twist yucca twine. 115
137. Feather-wrapped 2-ply Z-twist yucca twine. 115
138. Varieties of 2-ply S-twist yucca twine. 115
139. Varieties of multitwist yucca cordage. 116
140. Yucca-fiber bundles prepared for spinning. 117
141. Wrapped yucca-fiber bundle. 117
142. Yucca twine in 1-, 2-, and 3-ply patterns, and 3-ply Z-twist yucca twine. 118
143. Change from S- to Z-twist, and addition of third ply, in yucca twine. 118
144. Spliced lengths of yucca twine. 119
145. Wraps and knots of yucca twine. 119
146. Single-strand looping, and simple chain of two strands twisted at intervals. 120
147. Lengths and bundles of unspun yucca fiber. 120
148. Fragment of plain-weave cotton cloth. 121
149. Well-preserved piece of cotton cloth. 121
150. Fragment of decorated cotton cloth recovered by Nordenskiöld in 1891. 122
151. Lengths of cotton yarn. 122
152. Lengths of twine made from human hair. 122
153. Fragments of human-hair fabric made by knotless netting. 122
154. Various animal-skin fragments. 124
155. Sewing on animal-skin fragments. 125
156. Fragments of animal hide. 125
157. Bundle of sinew tied with yucca twine. 125
158. Skin objects: pouch and point guard or sheath. 125
159. Skin pouch or bag. 125
160. Length of cotton, 13-strand sennit braid, and drawing showing construction of braid. 126

161. Various ornaments. 127
162. Paint stones of hematite. 128
163. Variations in corrugation on Mesa Verde Corrugated sherds. 132
164. Large and extra-large corrugated jars. 134
165. Small corrugated jars. 136
166. Medium corrugated jars. 137
167. Large corrugated jars. 138
168. Large corrugated jars. 140
169. Zone patterning on sherds of Mancos-Mesa Verde Corrugated jars. 141
70. Applique figures on sherds of corrugated jars. 142
171. Painted figures on interior surface of rim sherds of corrugated jars. 143
172. Diagram of measurements needed to compute capacity of a corrugated jar. 144
173. Shapes of McElmo-Mesa Verde Black-on-white bowls. 148
174. Rim forms of McElmo-Mesa Verde Black-on-white bowls. 149
175. McElmo-Mesa Verde Black-on-white bowl designs: simple band lines. 150
176. McElmo-Mesa Verde Black-on-white bowl designs: narrow and broad lines. 152
77. Band motifs on McElmo-Mesa Verde Black-on-white bowls. 153
78. McElmo-Mesa Verde Black-on-white bowl designs. 154
79. McElmo-Mesa Verde Black-on-white bowl designs. 156
80. Opposed stepped triangle motifs on McElmo-Mesa Verde Black-on-white bowls. 156
81. McElmo-Mesa Verde Black-on-white bowl designs. 157
82. McElmo-Mesa Verde Black-on-white bowl designs. 158
83. McElmo-Mesa Verde Black-on-white bowl designs. 159
84. McElmo-Mesa Verde Black-on-white bowl designs. 160
85. Opposed ticked triangle motifs on McElmo-Mesa Verde Black-on-white bowls. 161
86. McElmo-Mesa Verde Black-on-white bowl designs: opposed triangles with pendent dots. 162
87. McElmo-Mesa Verde Black-on-white bowl designs. 163
88. Various combinations of framing lines for band designs on McElmo-Mesa Verde Black-on-white bowls. 163
89. McElmo-Mesa Verde Black-on-white bowls: non-band designs. 164
90. McElmo-Mesa Verde Black-on-white bowls: non-band designs. 164
91. McElmo-Mesa Verde Black-on-white bowls: centered designs. 166
92. McElmo-Mesa Verde Black-on-white bowls: miscellaneous designs. 168
93. McElmo-Mesa Verde Black-on-white bowls: unusual design patterns. 169
194. Mesa Verde Black-on-white bowl with similar band designs on its interior and exterior surfaces. 169
195. Band designs on exteriors of McElmo-Mesa Verde Black-on-white bowls. 170
196. Designs on exteriors of McElmo-Mesa Verde Black-on-white bowls. 170
197. Designs on exterior and interior bottoms of McElmo-Mesa Verde Black-on-white bowls. 171
198. Mesa Verde Black-on-white bowl with facing birds on exterior. 171
199. Mesa Verde Black-on-white bowl with related designs on its interior and exterior surfaces. 172
200. Designs on rims of McElmo-Mesa Verde Black-on-white bowls. 172
201. McElmo-Mesa Verde Black-on-white dippers. 173
202. Band and other designs on McElmo-Mesa Verde Black-on-white dippers. 174
203. McElmo-Mesa Verde Black-on-white dipper designs. 174
204. McElmo-Mesa Verde Black-on-white dipper designs. 175
205. McElmo-Mesa Verde Black-on-white mugs. 176
206. Designs on McElmo-Mesa Verde Black-on-white mug handles. 177
207. McElmo-Mesa Verde Black-on-white pitchers. 178
208. McElmo-Mesa Verde Black-on-white canteens. 179
209. McElmo-Mesa Verde Black-on-white seed jars. 179
210. McElmo-Mesa Verde Black-on-white kiva jars. 180
211. McElmo-Mesa Verde Black-on-white water jars. 182
212. Top and side views of Mesa Verde Black-on-white jar. 184
213. McElmo-Mesa Verde Black-on-white (?) jar. 185
214. Undecorated white ware vessels with slipped surfaces. 185
215. Undecorated white ware vessels with slipped surfaces. 186
216. Mancos Black-on-white vessels. 187
217. Chapin Gray bowl. 188
218. Mesa Verde Black-on-white bowl mended with original length of yucca twine. 188
219. Three views of Mesa Verde Black-on-white bowl with mend holes. 189
220. Small coiled basket. 192
221. Fragments of coiled basket trays (?). 192
222. Closeup of stitching in small coiled basket shown in fig. 220. 193
223. Beginnings of coiled baskets. 193
224. Three-quarter view of small yucca ring basket. 194
225. Bottom view of small yucca ring basket shown in fig. 224. 194

226. Small yucca ring basket. 194
227. Woven yucca headring. 194
228. Diagram of weaving pattern in yucca headring shown in fig. 227. 195
229. Woven yucca headring from Mug House in Wilmarth collection, Colorado State Museum. 195
230. Tied yucca bundles and wrapped cornhusk ring. 195
231. Ceramic jar lids. 196
232. Ceramic jar lids and sherds reworked into jar lids. 197
233. Sandstone covers. 198
234. Sandstone covers found atop corrugated storage jars. 199
235. Adobe stopper. 198
236. Some metates from Mug House. 201
237. Top and side views of metates and metate blank. 202
238. Some manos from Mug House. 203
239. Various mano styles. 204
240. Top and side views of two grinding stones. 207
241. Handstones. 207
242. Stone mortar in Mesa Verde Museum collections. 208
243. Paint pestles. 208
244. Notched and grooved hammer heads. 209
245. Hammer head with oak handle. 210
246. Pitted pounding stones. 211
247. Ax heads showing degrees of finish. 212
248. Ax heads. 213
249. Ax heads from Room 77. 214
250. Ax head with fragmentary oak handle. 215
251. Comparison of bits and cutting edges of ax head and probable adz head. 216
252. Celt. 216
253. Chipped stone knives. 217
254. Chipped stone knives, drills, and saw. 218
255. Humerus scrapers. 220
256. Blade ends and edges of humerus scrapers. 221
257. Tibia scraper. 222
258. Bone awl styles. 223
259. Kit of pointed bone tools found with Burial M31. 224
260. Bone reamers. 225
261. Bone needles. 225
262. Yucca-leaf needle and thread, and length of similar cordage. 225
263. Wooden awls and punch. 226
264. Bone awls with transverse grooves, matting (?) tool, and weaving tool. 227
265. Wooden battens. 228
266. Fragment of wooden spindle whorl. 228
267. Stone shaft straightener. 229
268. Bone spatulas. 230
269. Worn tips of antler flakers. 230
270. Fragment of a willow mat with Burial M2, Adobe Cave. 232
271. Fragment of a willow mat. 232
272. Fragments of twilled rush matting, and a reed with twine through it. 233
273. Fragment of a twined mat of reeds from Mug House in Mesa Verde Museum collections. 233
274. Diagram of twining technique of reed mat shown in fig. 273. 233
275. Sketch of wooden cradle elements. 233
276. Wooden fire drill and hearth. 234
277. Wooden stirring paddle and pokers. 234
278. Tumpline headbands. 235
279. Tumpline headband from Mug House in Wilmarth collection, Colorado State Museum. 236
280. Lengths of twine sewed together. 237
281. Various yucca-strip knots. 237
282. Yucca-strip wrappings. 238
283. Yucca-strip ties. 239
284. Yucca strips used in mesh, chains, and braids. 239
285. Narrow-leafed yucca plant. 239
286. Stone tablets. 242
287. Probable ceremonial objects. 243
288. Animal (?) effigy. 243
289. Reed cigarettes. 244
290. Feather quill inserted in corncob. 244
291. Bundle of sagebrush twigs. 245
292. Miniature clay bowls. 245
293. Clay figurines from Adobe Cave. 245
294. Clay figurines from Mug House representing a possible human head or face and body. 245
295. Sherds reworked into unusual shapes. 246
296. Tchamahias. 247
297. Tchamahia fragments. 247
298. "Club heads." 248
299. "Specialized rubbing stone." 249
300. Small mammal tibia with ground and cored proximal end and perforated shaft. 250
301. Perforated tibias of jackrabbit and cottontail. 250
302. Aspen bark "cylinder." 251
303. Stick figure. 251
304. Sticks wrapped with yucca strip and yucca twine. 252
305. Cornhusk bundle. 252
306. Ground oak chip. 252
307. Folded cornhusk wad. 253
308. Composite pollen profile of Mug House. 258

tables

1 Dates derived from Mug House tree-ring specimens. 19
2 Clustering of tree-ring dates from Mug House. 20
3 Component A sherd counts. 20
4 Component B sherd counts. 24
5 Site 1227 artifact assemblage. 25
6 Adobe Cave artifact assemblage. 25
7 Component C sherd counts. 25
8 Relative proportions of pottery types by component. 26
9 Wooden architectural items in Suite 12/1. 33
0 Mug House and Adobe Cave burials. 88
1 Probable food animals. 105
2 Twilled sandal fragments. 112
3 Yucca fibers in cordage. 114
4 Yucca cordage, class A fiber. 117
5 Yucca cordage, class B and C fibers. 118
6 Twines over 17 inches (45.0 cm.) in length. 120
17 Cotton textiles. 123
18 Distribution of calculated or measured capacities of 59 Mesa Verde Corrugated jars. 144
19 Dipper handle shapes. 173
20 Estimated total vessel counts. 190
21 Total counts of McElmo-Mesa Verde Black-on-white sherds. 190
22 Total counts of corrugated sherds. 191
23 Total counts of non-corrugated utility ware sherds. 191
24 Total counts of sherds of all other pottery types. 191
25 Metates and metate blanks. 203
26 Manos. 206
27 Stone ax heads. 215
28 Bone awls. 224
29 Bone reamers. 225
30 Bone awls with transverse grooves. 226

N°13

CHAPTER 1

history of mug house

Of all these houses the one most remarkable for what we found in it was the Mug House, so named because of four or five mugs found tied together with strings through their handles. It appeared as though the people had been frightened away with no opportunity to carry anything with them. All seemed to have been left just where it had been used last. No house in Mesa Verde yielded so much in proportion to size.

These were the observations of Charles C. Mason (1917), one of the original band of men who made the first extensive explorations of the Mesa Verde cliff dwellings. They are contained in a written narrative he presented ("with the approval of the Wetherill boys"), some three decades after the initial finds, to the State Historical Society of Colorado.

The discovery in 1888 by the Wetherill family of several large cliff dwellings at Mesa Verde, containing the utensils and other manufactures of a prehistoric people, stimulated a general search for ruins and relics. Others had known of some of the lesser Indian ruins for many years. It was the five Wetherill brothers, however, and Mason, their brother-in-law, who brought widespread recognition to the dwellings through their systematic explorations during the winter seasons, when they were not occupied by ranch work.

The Wetherills were relative newcomers to the area, having settled in the Mancos Valley, just east of Mesa Verde, in 1881. Their 160-acre Alamo Ranch was to become a center for curiosity seekers, as well as scientists, drawn by the mystery of the Indians who once populated the ruins of Mesa Verde.

In the course of their explorations, they came upon Mug House and the other major ruins on Wetherill Mesa during the winter of 1889–90. Carved on the rock in front of Room 25 in Mug House is the inscription "Wetherill 1890."

An idea of what they collected on their first visit to Mug House can be gained from notes apparently made by Richard Wetherill, the eldest brother and the leader of most of their explorations. These notes, now on file at the University Museum, University of Pennsylvania in Philadelphia, list the following collection from an unnamed ruin:

> Bowl, 4 axes, 26 awls, sandals, 2 B knives [probably bone humerus scrapers], willow mat, braided rings, Baby rack, Small pitcher, dipper, 2 arrow points. Basket, 2 jars with rim for lids [kiva jars], 2 bow strings, Buckskin and cloth sack, 6 axes with handles, 3 cups tied together [probably the mugs for which Mug House was named], 2 small cups, small jug, 3 pr. sandals, 4 bowls, 3 belts cotton and yucca [tump-bands or belts]. Arrow point. Large jar hair leggins, pannier [carrying basket], willow matting, stone knife, cotton cloth, stone slab, 3 cups with figure of birds and animals, jug, dippers.

The three mugs tied together and the general context of the notes indicate this ruin was Mug House. These various objects cannot definitely be identified among the many artifacts from Mesa Verde ruins in the University Museum's collections.

In the summer of 1891, John Wetherill helped Gustaf Nordenskiöld, the 23-year-old son of a Swedish nobleman, excavate in a number of the cliff dwellings. Their stay in Mug House, which they designated as Ruin 19, was short. Nordenskiöld illustrated 26 separate items of pottery, stone, bone, shell, and perishable materials taken from Mug House, and made these observations in his classic report, *The Cliff Dwellers of the Mesa Verde:*

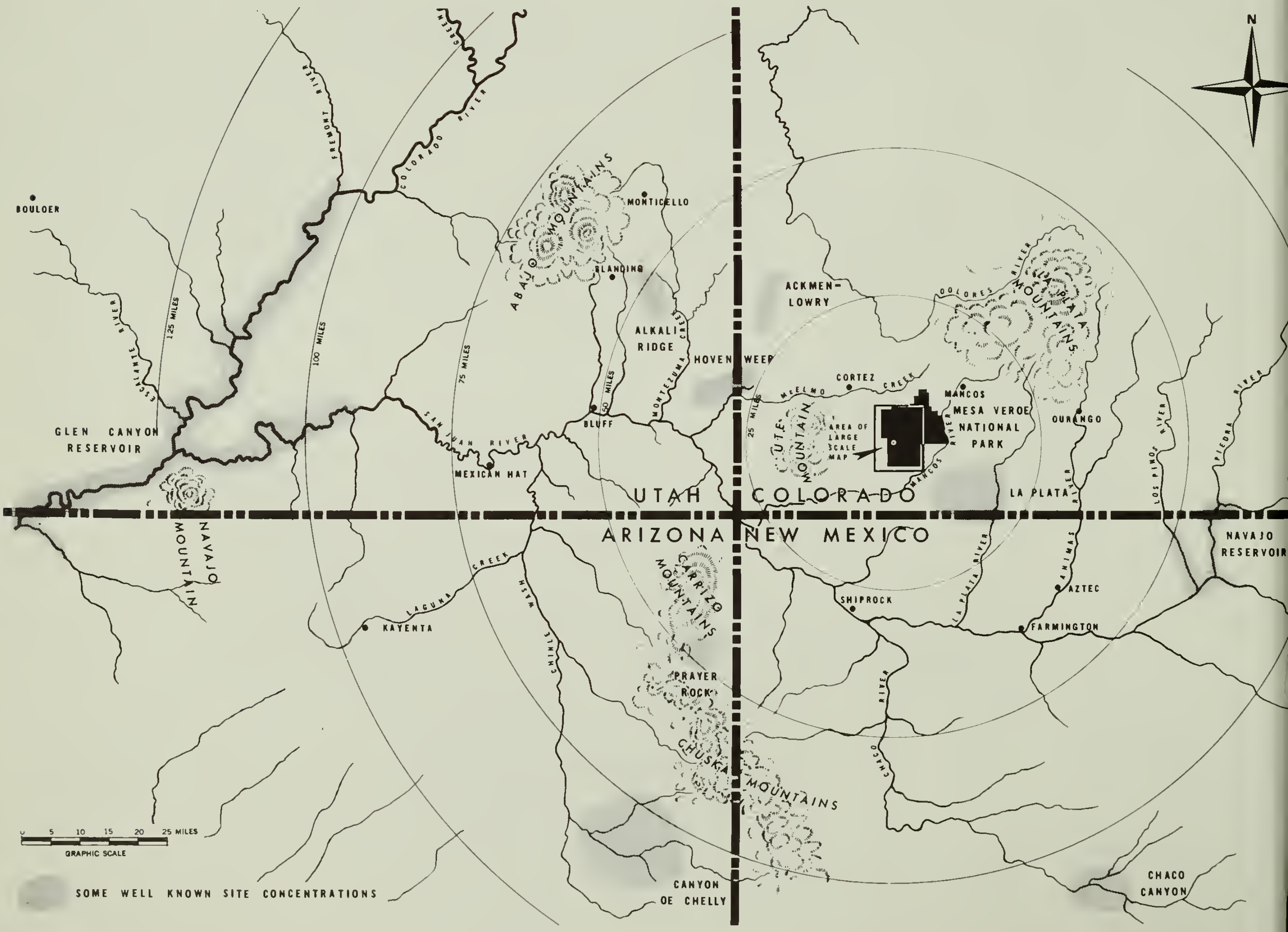
> Still farther north [of Long House] lies another large ruin, named *Mug House* from the quantity of pottery, especially mugs, which has been found there. . . .
>
> At Mug House rather considerable portions of the ruin have been buried under large blocks that have fallen from the roof of rock. This may possibly be an indication of the great age of the ruin. In a room under one of these blocks we found a quantity of perforated shells . . . which had probably composed a necklace, and two well preserved and handsomely ornamented earthenware vessels. Neither in Mug House nor in ruin 16 were our excavations very extensive.
>
> . . . Mug House contains the only example of a fireplace that I have observed in any cliff-dwelling, except the hearths which always occupy the centre of the estufas [now termed kivas]. This fireplace consists of a curved elevation of masonry in a corner of one of the rooms. . . . (Nordenskiöld, 1893, pp. 35–36.)

Other early accounts of the Wetherills' activities at Mesa Verde give no more details about Mug House specifically. We can assume that this site, like others, received visits from sightseers and relic-hunters in the 18 years following the Wetherills' discovery, until 1906 when Mesa Verde National Park was established and the period of unrestricted exploration came to an end.

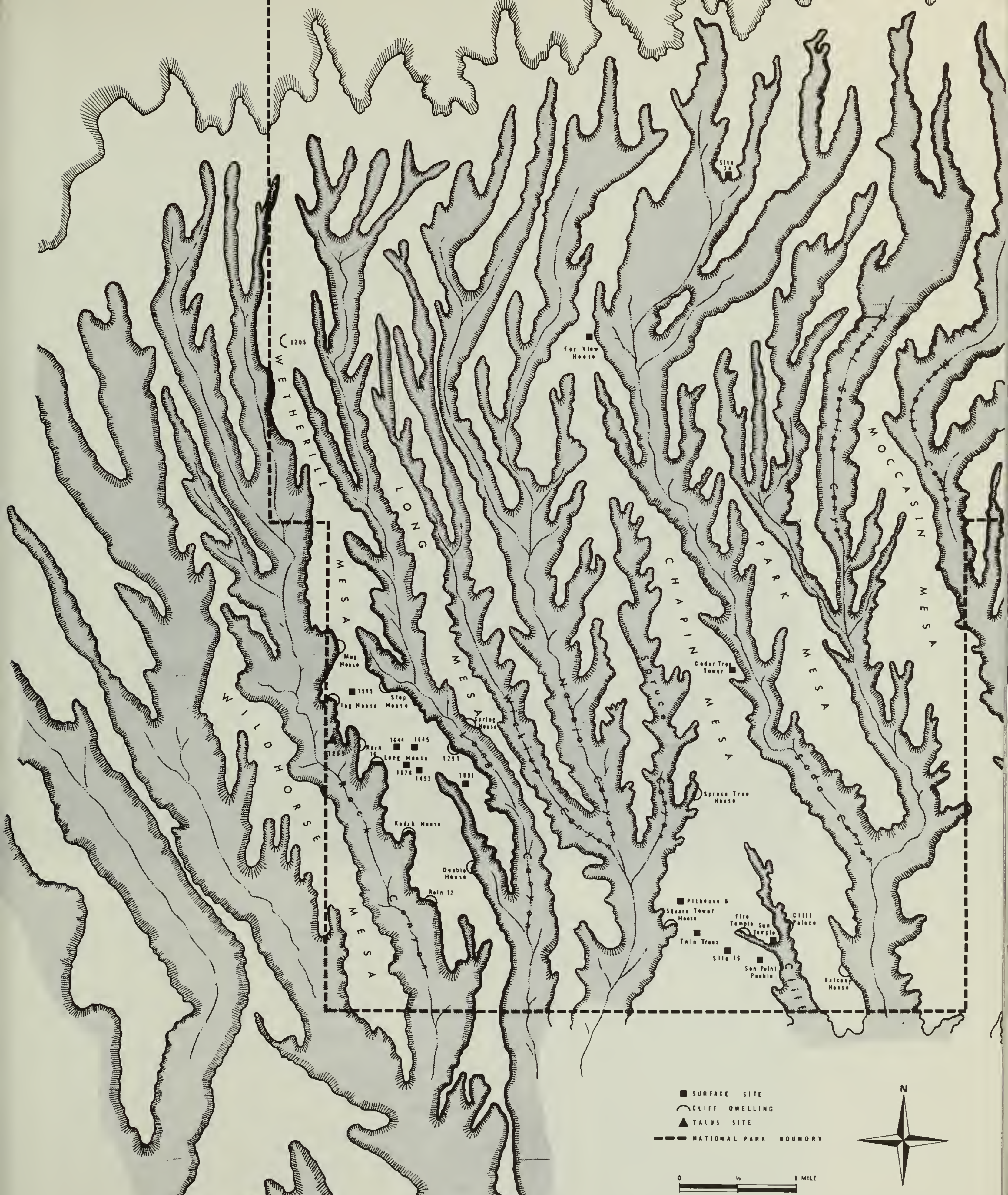
THE SETTING

Mesa Verde is a large, south-sloping cuesta formed as an erosional remnant when stream action lowered the land around it into canyons and valleys (fig. 1). On its north and west sides is a steep escarpment where such streams as McElmo Creek pirated the headwaters of old watercourses that once carried most of the regional drainage southward over Mesa Verde. The Mancos River has cut a 1,000-foot-deep canyon along the east and south sides and receives the present intermittent drainage from the mesa. The mesa itself is cut by about 15 roughly parallel, steep-sided canyons into a series of fingerlike projections. Mug House is on the edge of one of these "fingers," named for the Wetherills by Nordenskiöld (1893), and overlooks Rock Canyon (fig. 2).

The rocks making up Mesa Verde are principally sandstones laid down under a shallow sea during the Upper Cretaceous period. From top to bottom, the Cliff House sandstone, Menefee formation (mostly shale—of continental origin), and Point Lookout sandstone constitute the Mesaverde group, which overlies the Mancos


1 Four corners area.

N
GREEN
FREMONT RIVER
COLORADO RIVER
BOULDER
ESCALANTE RIVER
125 MILES
100 MILES
75 MILES
50 MILES
25 MILES
ABAJO MOUNTAINS
MONTICELLO
BLANDING
ALKALI RIDGE
MONTEZUMA CREEK
HOVENWEEP
ACKMEN-LOWRY
DOLORES RIVER
LA PLATA MOUNTAINS
CORTEZ
McELMO CREEK
MANCOS
MESA VERDE NATIONAL PARK
UTE MOUNTAIN
AREA OF LARGE SCALE MAP
MANCOS RIVER
DURANGO
GLEN CANYON RESERVOIR
SAN JUAN RIVER
BLUFF
MEXICAN HAT
NAVAJO MOUNTAIN
UTAH
COLORADO
ARIZONA
NEW MEXICO
LA PLATA
ANIMAS RIVER
LOS PINOS RIVER
PIEDRA RIVER
NAVAJO RESERVOIR
CARRIZO MOUNTAINS
LAGUNA CREEK
KAYENTA
CHINLE WASH
SHIPROCK
LA PLATA RIVER
AZTEC
FARMINGTON
PRAYER ROCK
CHUSKA MOUNTAINS
CHACO RIVER
CANYON DE CHELLY
CHACO CANYON
0 5 10 15 20 25 MILES
GRAPHIC SCALE
SOME WELL KNOWN SITE CONCENTRATIONS


Site 34
Far View House
1205
WETHERILL
LONG
MESA
CHAPIN MESA
PARK MESA
MOCCASIN MESA
WILDHORSE
MESA
Mug House
1595
Jug House
Step House
Spring House
1644
1645
Rain 16
1253
Long House
1291
1676
1452
1801
Kodak House
Double House
Ruin 12
Cedar Tree Tower
Spruce
Spruce Tree House
Soda Canyon
Pithouse B
Square Tower House
Fire Temple
Sun Temple
Cliff Palace
Twin Trees
Site 16
Sun Point Pueblo
Cliff
Balcony House
SURFACE SITE
CLIFF DWELLING
TALUS SITE
NATIONAL PARK BOUNDRY
N
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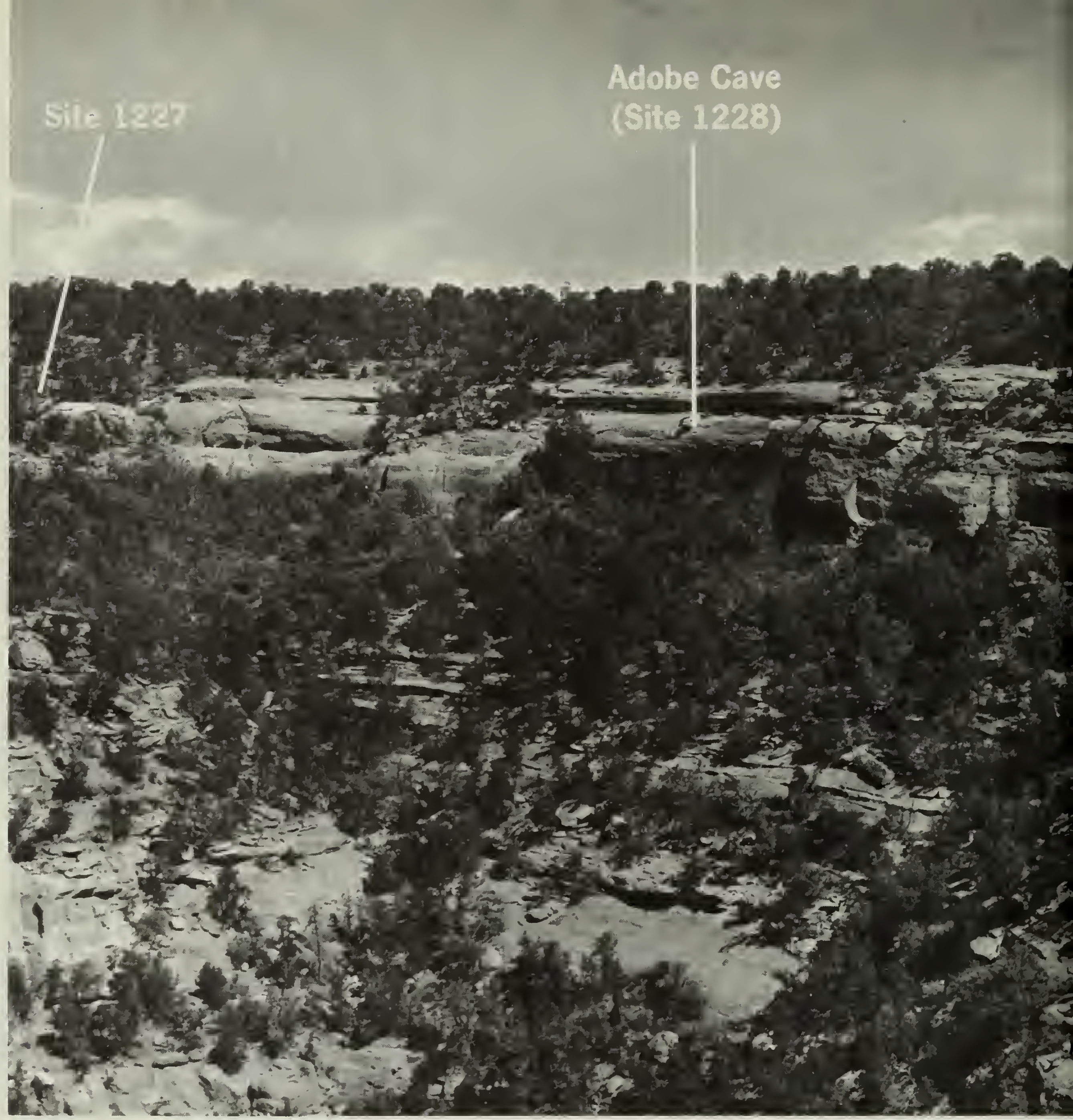
1 MILE
GRAPHIC SCALE

2 *Western part of the Mesa Verde, showing locations of excavated sites.*



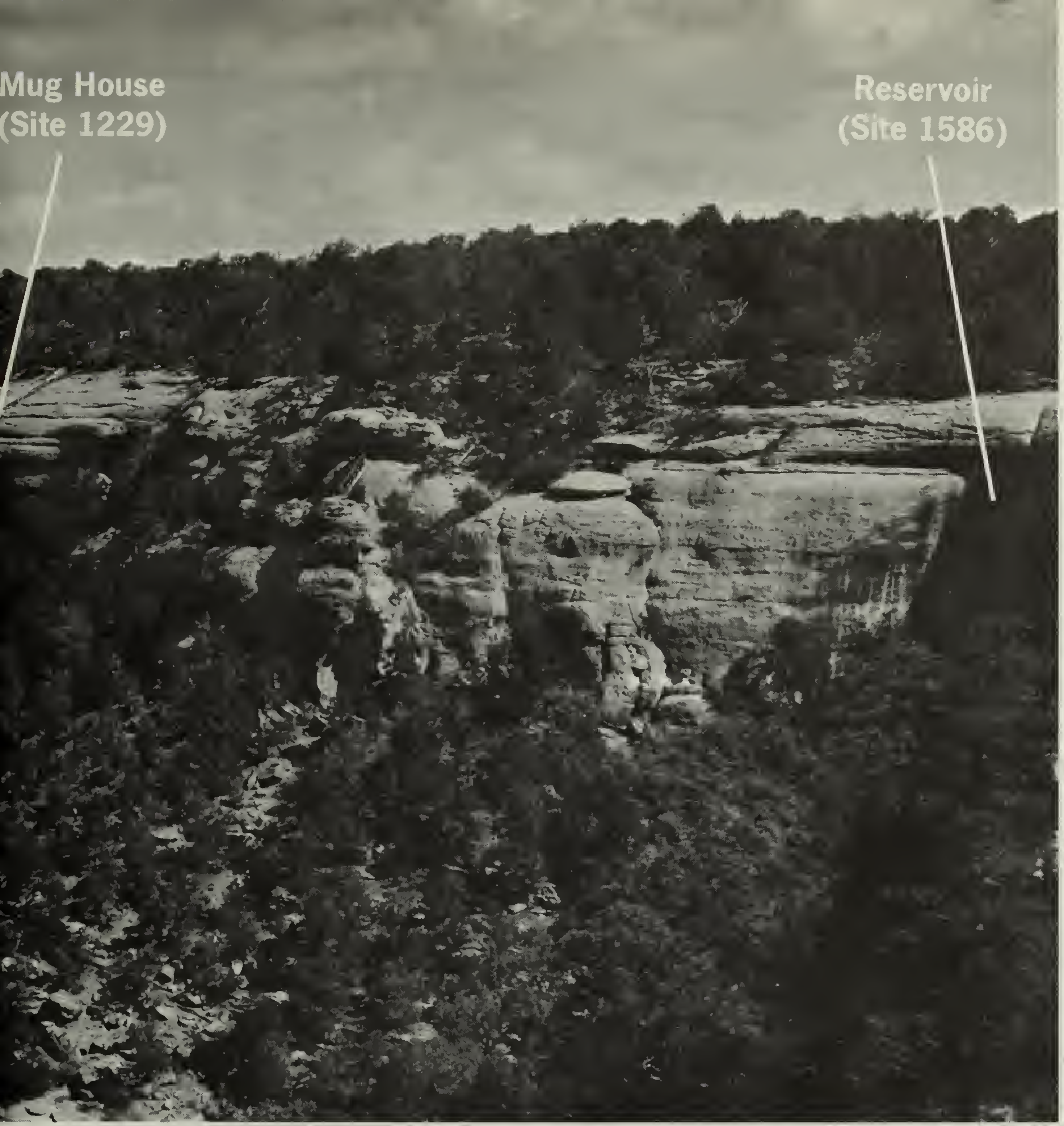
3 *Mug House alcove, center, and Adobe Cave, left center.*

shale (Wanek, 1959). Both sandstones tend to form vertical cliffs as the softer shales wear away beneath them. Fossils of ancient sea life found their way from these formations into the lives of the prehistoric Mesa Verdeans.

To a young Indian born and reared in Mug House, the primary orientation would be up and down—up to the mesa top and down toward the canyon bottom. Mug House is situated in a shallow cave, or rock shelter, approximately 200 feet long and up to 40 feet deep. A ledge in the north half stands about 15 feet above the level of the lower cave. Rising above this level is about 90 feet of nearly vertical sandstone cliff, forming the western edge of the relatively flat top of Wetherill Mesa. Stretching below the cave is a steep, rugged talus slope covered with rock fragments that have broken loose from the cliff face. A second cliff, less outstanding and more easily traversed than its upper companion, interrupts this slope and caps the long talus that ultimately descends to the bottom of Rock Canyon, almost 600 feet below the cave floor. This sequence is repeated on the opposite side of the canyon, a half-mile away. The two sandstone cliffs with the intervening talus belong to the Cliff House Sandstone, the lower talus slopes to the Menefee formation.

The only directions in which one can walk without having to go up or down are at the juncture of cliff and talus slope, north and south of the cave. Trails here provide the primary means of access to the site. In order to climb to the mesa top, it is necessary to follow one of them to a point where the cliff is sufficiently broken to allow passage. Two nearby smaller caves with signs of human occupation and a water catchment basin lie along these routes.

The flat top of Wetherill Mesa measures only 750 feet



across in the latitude of Mug House, but it rapidly widens to about 2,500 feet within a quarter of a mile to the south. From Mug House southward, the mesa top is blanketed with a dark red loess in which silt-sized particles predominate. To the north, tan and buff-colored sands and silts cover the narrow, ridgelike mesa top for 1¼ miles, as far as Rock Springs. Erosion has carried quantities of these soils onto the talus slopes, to join the jumble of rock fragments and pockets of residual soils.

Both mesa top and canyon support a general pinyon-juniper woodland, which comprises many distinct ecological communities. Erdman (MS.) characterizes the major stand-types according to the principal species in the understory of the dominant pinyon (*Pinus edulis* Engelm.) and Utah juniper (*Juniperus osteosperma* [Torr.] Little). The narrow mesa top north of Mug House has a significant stratum of tall shrubs, with mountain-mahogany (*Cercocarpus montanus* Raf.) predominant over bitterbrush (*Purshia tridentata* [Pursh] DC.), fendlerbush (*Fendlera rupicola* A. Gray), and serviceberry (*Amelanchier utahensis* Koehne), between the trees and grasses. In the broader loess-covered area to the south, shrubs are absent and the most common understory species is mutton grass (*Poa fendleriana* [Steud.] Vasey).

The relatively open woodland of the talus slopes exhibits a variety of brushy species: oak (*Quercus gambelii* Nutt.) thickets in washes and shady places; mockorange (*Philadelphus microphyllus* A. Gray) and brickellbush (*Brickellia grandiflora* [Hook.] Nutt.) on the canyon rims and rocky ledges; serviceberry, mountain-mahogany, rabbitbrush (*Chrysothamnus nauseosus* [Pall.] Britt.), bitterbrush, and joint-fir or Mormon tea (*Ephedra* *viridis* Coville) are more widespread. A stand of Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franke) and fendlerbush occupies the north-facing slope on the south side of the large alcove, or indentation in the canyon side, in which Mug House is located. A narrow-leafed yucca (*Yucca harrimaniae* Trel.) is found sporadically only on these slopes, but a broad-leafed variety (*Yucca baccata* Torr.) occurs consistently throughout the forest.

The alluvial terraces in the canyon bottom are covered mostly with big sagebrush (*Artemisia tridentata* Nutt.). In contrast, the open washes occasionally contain saltcedar (*Tamarix pentandra* Pall.), coyote willow (*Salix exigua* Nutt.), and Indian ricegrass (*Oryzopsis hymenoides* [Roem. & Schult.] Ricker).

Animals include mule deer (*Odocoileus hemionus* Rafinesque), bighorn sheep (*Ovis canadensis* Shaw), cougar (*Felis concolor* Merriam), bobcat (*Lynx rufus* Merriam), coyote (*Canis latrans* Merriam), gray fox (*Urocyon cinereoargentus* Mearns), ringtail (*Bassariscus astutus* Rhoads), badger (*Taxidea taxus* Baird), spotted skunk (*Spilogale gracilis* Merriam), and porcupine (*Erethizon dorsatum* Mearns). There are also many kinds of rabbits, wood rats, squirrels, chipmunks, mice, snakes, lizards, and a variety of birds and insects (Anderson, 1961).

Mug House lies near the middle of a large, shallow alcove in the east side of Rock Canyon (fig. 3). The two chief drainages, located in the northeast and southeast corners of the alcove, spill over the canyon rim at Site 1227 and at the Mug House reservoir (Site 1586), and they merge about halfway down the canyon slope. A minor drainage forms on the talus directly below Mug House and soon joins the other two. No springs or seeps have been found within the alcove itself.

Little can be said about climate and weather that applies principally to Mug House. In general, sunlight is one of the most significant factors concerning comfort, supplying warmth even on cold winter days. Mug House cave faces almost due west, so that it receives virtually no sunlight until well past midday. Some portions of the ruin are shaded more than nine-tenths of the time. As a result, the warmth of the sun's rays can be felt here only in the afternoon, when air temperatures are at their peak anyway. Fire as a source of heat must have been extremely important to the Mug House inhabitants.

A second factor affecting comfort must have been the wind. The alcove forms a natural funnel for the daily updrafts and downdrafts caused by differential heating from solar radiation on canyon sides, and strong winds may be felt along the mesa rim, especially in the afternoon. The rock shelter itself is just beyond the course of these drafts, but it is astonishing how often light objects are carried up over the top of the cliff from the mouth of the cave.

PREVIOUS WORK

It was not until the late 1920's that the National Park Service directed attention to the ruins on Wetherill Mesa. Superintendent Jesse L. Nusbaum's 1928 West Side Expedition spent 3 weeks during March of that year digging in nine cave sites, including Mug House (Nusbaum, 1928). No details are available on the nature of the finds or exactly where he dug within the sites.

The first tree-ring specimens from Mug House were collected in the summer of 1932 and yielded two dates of A.D. 1066 (Getty, 1935). This date was frequently cited as the time when the great cliff-dwelling period began at Mesa Verde. We know now that the dated specimens belonged originally to a structure which had been built during an earlier period of occupation.

By 1935, deteriorating walls in Mug House prompted an extensive stabilization project. J. A. Lancaster directed a crew that spent 20 days in June and July of that year repairing many walls and leveling rubble fill to prevent the undermining of other walls. (An excellent set of photographs and Lancaster's daily log have proved invaluable in attempts to reconstruct prehistoric conditions.) While gathering dirt for mortar in neighboring Adobe Cave, Lancaster encountered several burials which were excavated the following October by Paul R. Franke and Robert F. Burgh (Franke, 1935). During this same period, Lancaster observed and recorded a prehistoric reservoir (Site 1586), south of Mug House.

The Gila Pueblo survey assigned number 118 to Mug House in 1941 while collecting wood specimens for tree-ring dating. The site card for "Mesa Verde 118" lists no information other than the name of the site and the field numbers of the tree-ring samples. O'Bryan (1950, p. 114) lists 11 dates derived from this material.

Since the discovery of the large Mesa Verde cliff houses in the late 1880's, many books and articles have been written about them. Although Mug House is rarely mentioned by name, it is probably represented in the generalized descriptions of the ruins and the associated artifacts. Because of such vagueness, I have cited only specific references to actual work done at the site. We have little hope of discovering how many other persons have dug in Mug House or the number of artifacts they may have removed.

THE WETHERILL MESA PROJECT

In planning new exhibits and facilities for Mesa Verde National Park in connection with the National Park Service's Mission 66 Program, Mug House was selected as one of three large cliff dwellings to be opened to visitors. The Wetherill Mesa Survey assigned the number 1229 to the ruin in April 1959.

Excavation and stabilization were carried on concurrently for 6 months during 1960 and 5 months in 1961. The field crew averaged seven, including an archeologist, a photographer, a cataloger, and laborers, although the number working at any one time varied considerably. The man-days spent on stabilization very nearly equalled those expended in excavation.

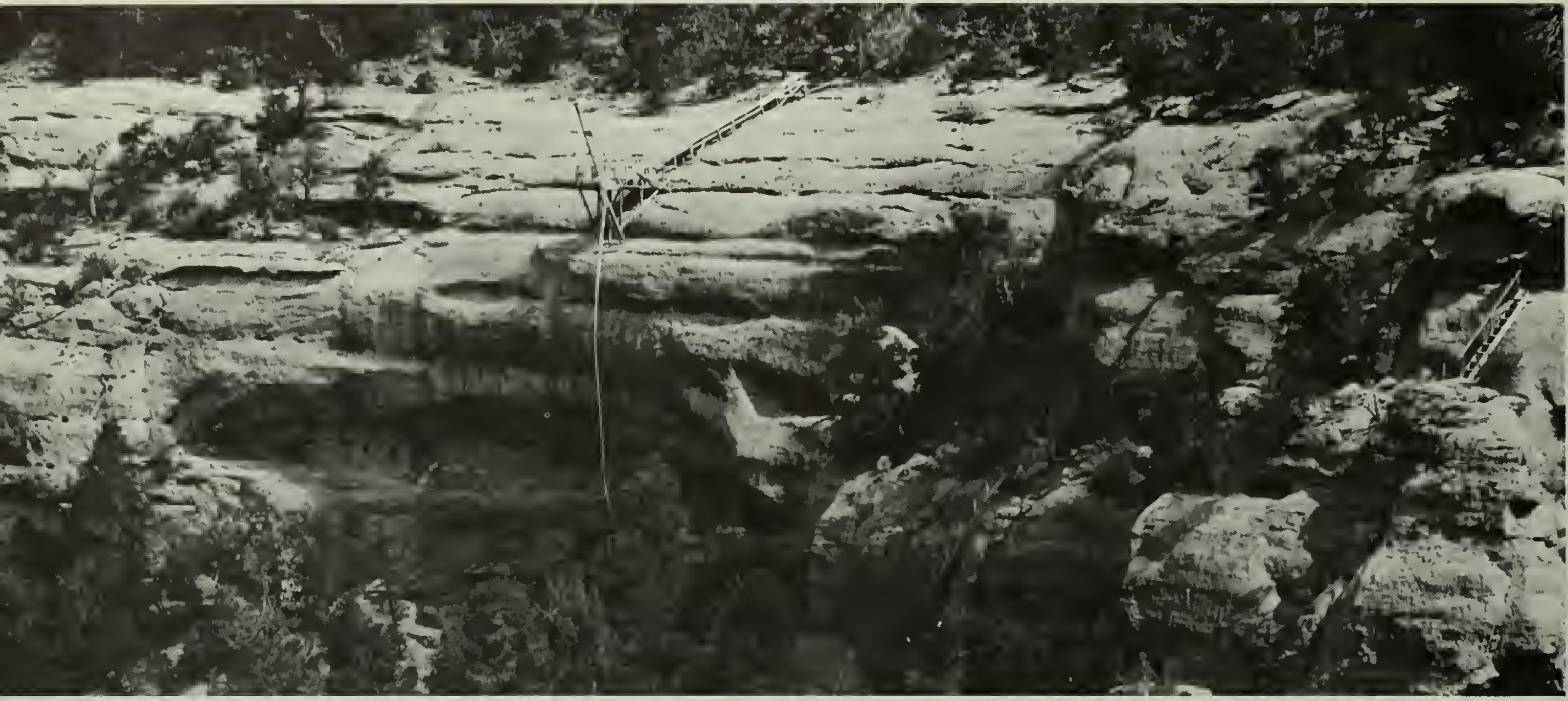
In 1961, the Mug House reservoir (Site 1586) was excavated and stabilized, and cross trenches were begun in Adobe Cave (Site 1228). We completed the Adobe Cave trenches in 1962 and then backfilled them. We also made a thorough surface collection in another nearby cave, Site 1227, and dug two limited tests there to determine the depth of fill above room floors.

4 Stripping trash slope below Mug House.

Before actual digging began, Mug House was photographed and mapped and all artifacts on the surface were picked up. While the map was being completed, several men commenced stripping the slope in front of the houses where the Mug House inhabitants (let us call them henceforth "Muguenos," in somewhat the same manner as we identify residents of Los Angeles as "Angelenos") had thrown their trash. Starting with a horizontal trench near the base of the slope, the men dug upward, depositing backdirt beneath their feet (fig. 4). In this way the entire slope was overturned with a minimum of dirt movement. When the outermost retaining walls of the pueblo were encountered, clearing out the rooms and kivas began.

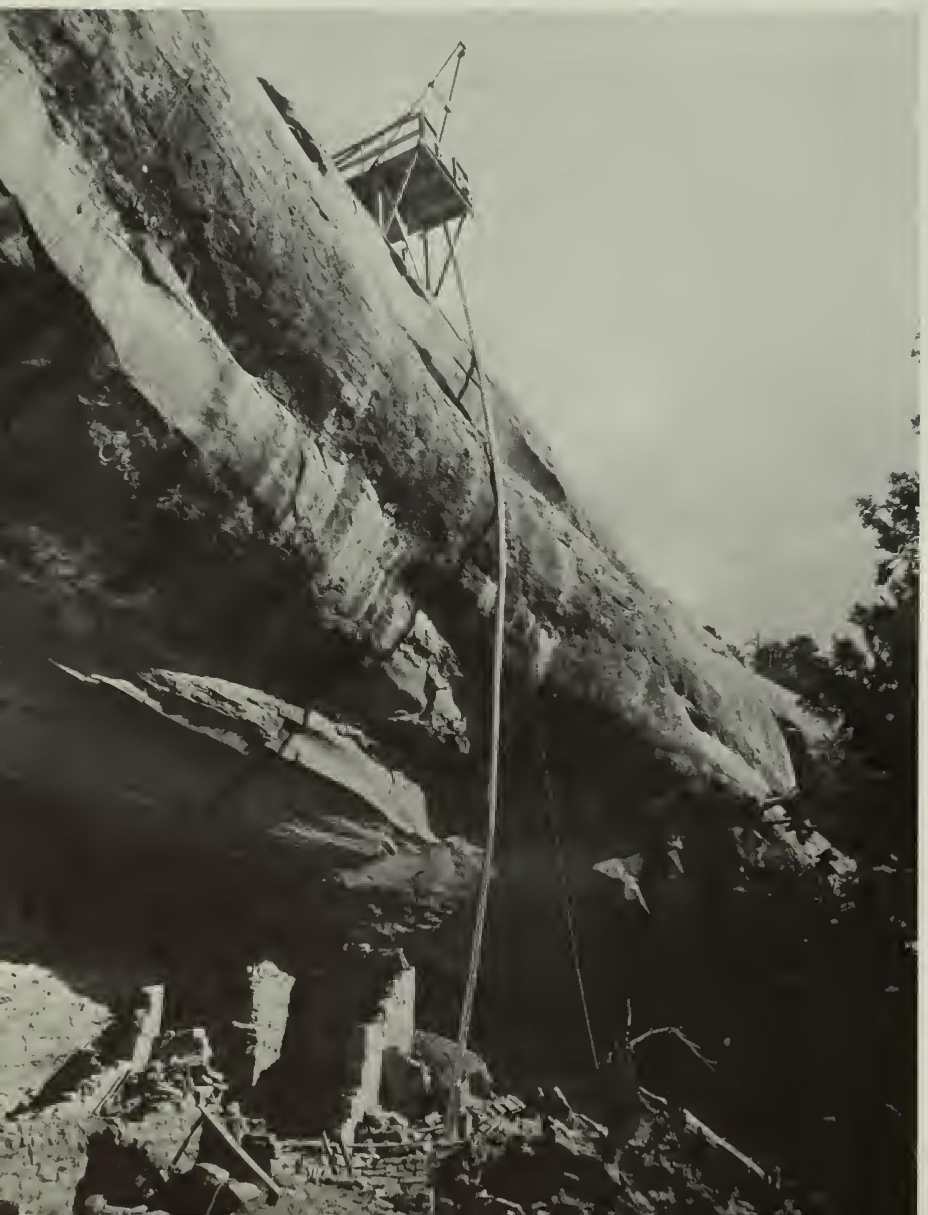
To avoid transporting backdirt and rock across already excavated structures, we attacked the upper ledge first. Then the back rooms in the lower cave were cleared, with the work progressing outward, both toward the mouth of the shelter and toward the two ends. Backdirt from rooms and kivas was deposited on the excavated trash slope and behind new and rebuilt retaining walls across the front of the cave. As each unit of excavation was dug, it was mapped, photographed, and described in notes, before being stabilized. Thus, while some men dug in one part of the site, others used old building stones and backdirt to stabilize buildings elsewhere.

To lower tools and materials for stabilization into the cave and to hoist out archeological specimens and equipment, J. A. Lancaster designed a simple yet effective



5 Equipment for lowering materials.

6 Platform with A-frame at cliff edge. Tube of 6-inch stovepipe conveys sand and dry soil used in stabilization.



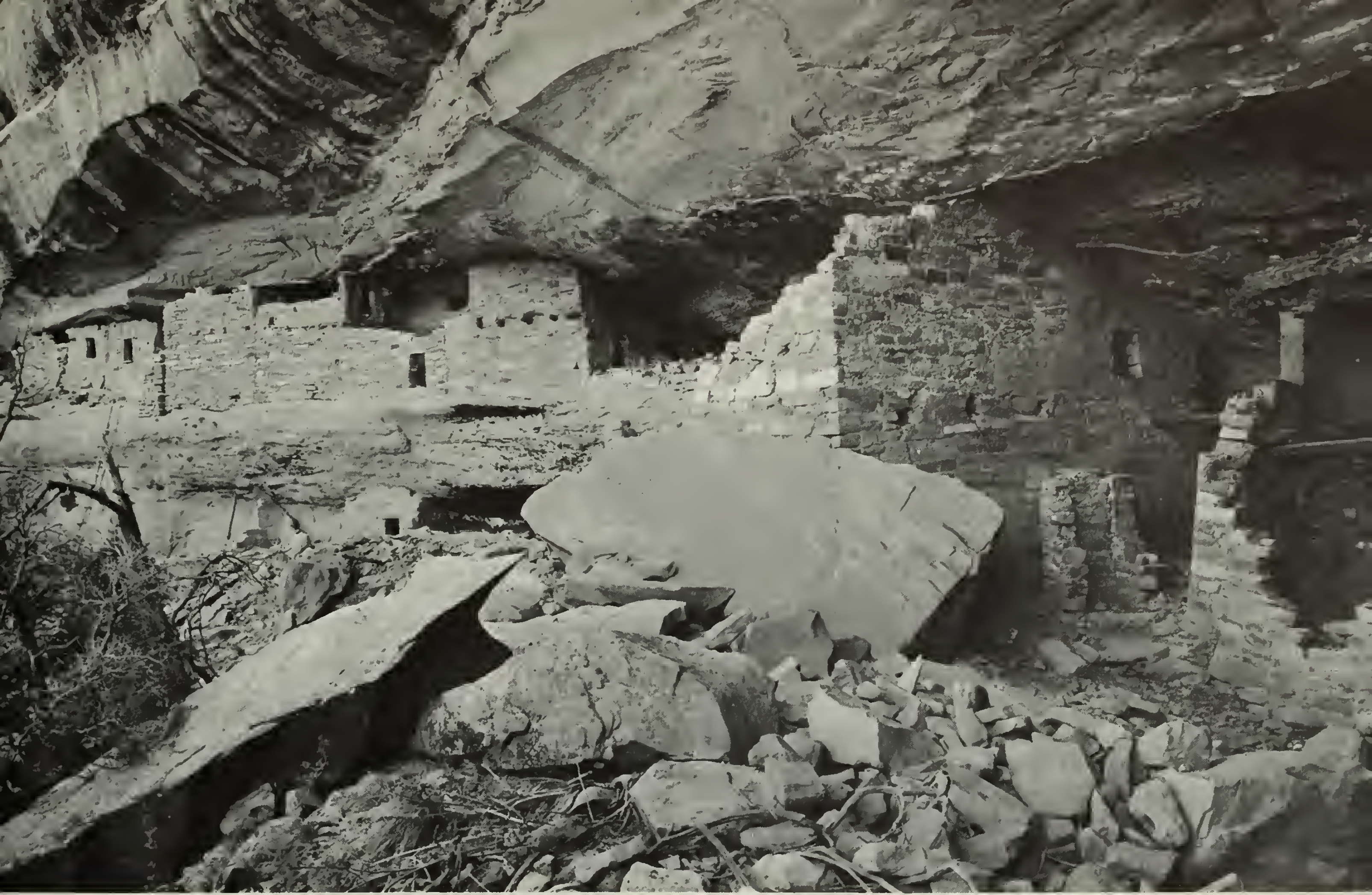
device which was built by D. A. Decker (fig. 5). It consisted of a wooden platform anchored to the very lip of the cliff above the center of the ruin and was reached by a flight of steps traversing a steeply sloping bare rock area between it and the level mesa top. The platform supported an A-frame from which a long rope was suspended through a single pulley. One man could raise and lower light loads, although two were generally employed in these operations. Sand and dry dirt rode down a metal chute alongside the stairway into a long, vertical tube constructed of sections of 6-inch stovepipe attached to one side of the platform (fig. 6). Water was brought into the ruin through a garden hose attached to a small storage tank next to the service road.

The dark portions of the upper ledge were illuminated during work periods by lights run from a 2-kilowatt gasoline generator perched on the edge of the cliff. A field telephone system permitted contact with the camp and other excavation crews.

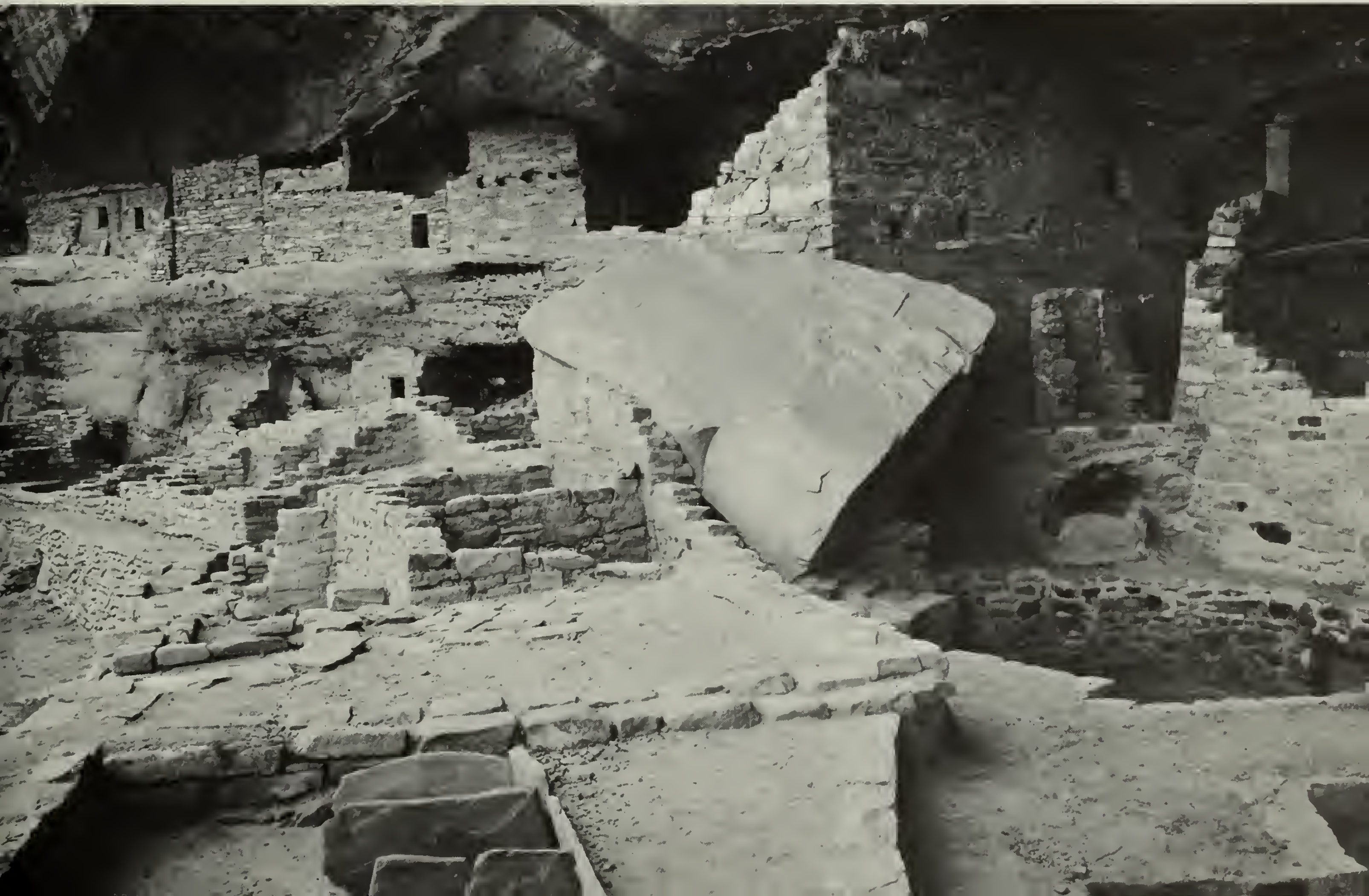
Some idea of the scope of the work at Mug House can be gained from several sets of "before" and "after" views of the site (figs. 7–12). The latter include the results of stabilization that followed our excavation. All repairs reflected our knowledge of aboriginal conditions at the time they were made. Subsequent discoveries, suggesting different interpretations, are discussed herein.

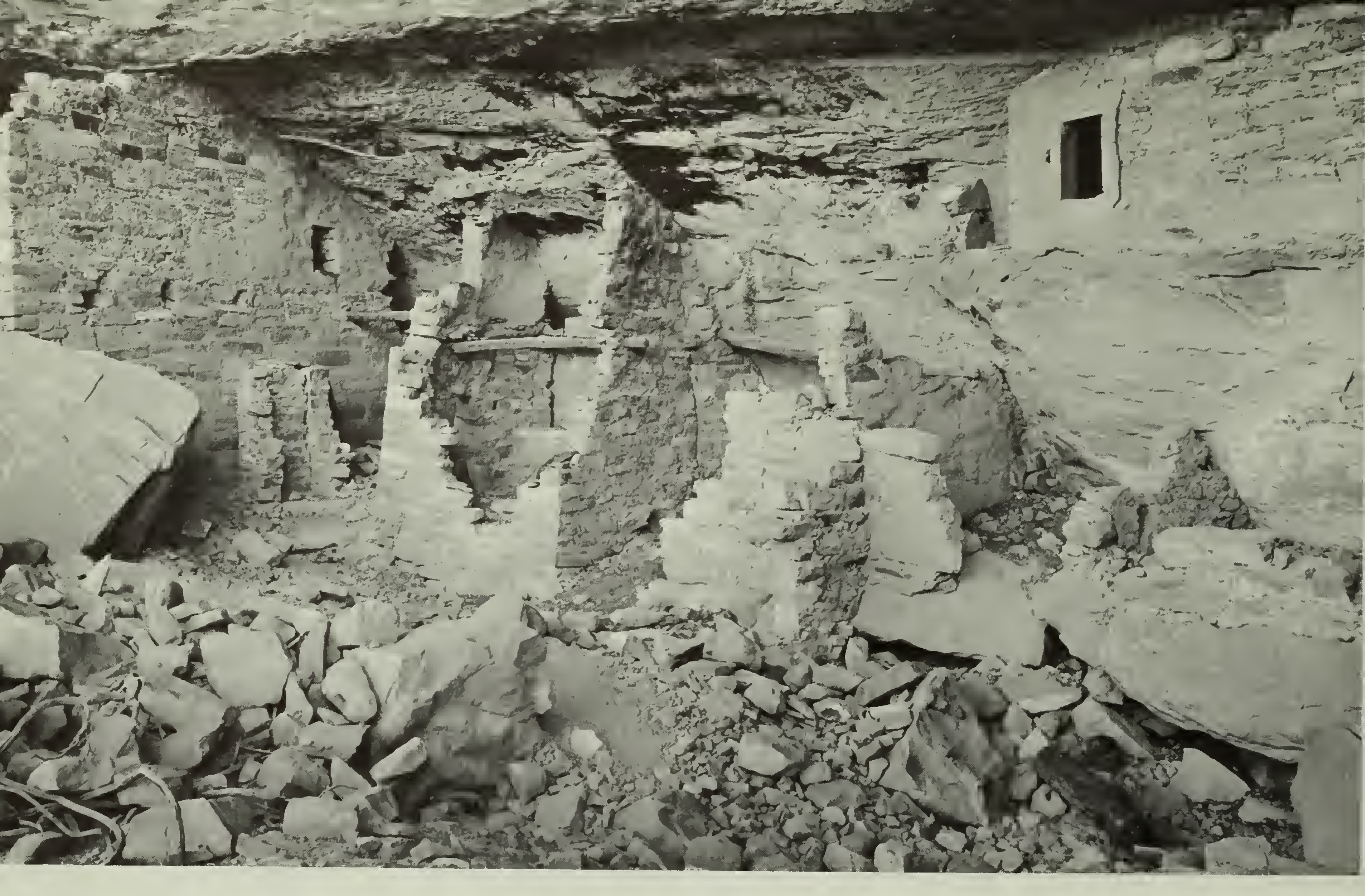
The natural processes of erosion created some unexpected problems and caused a certain amount of face-lifting of the sandstone cliff. In the early stages of our work, we found that a sizable portion of the cliff edge above the north end of the shelter was cracked free from the ledge. When a 10-ton block yielded easily to the pressure of an alining bar and fell, we hastened to remove an additional 15 tons of loose sandstone.

Later, the men digging on the upper ledge found a large but thin slab of the cave roof almost completely

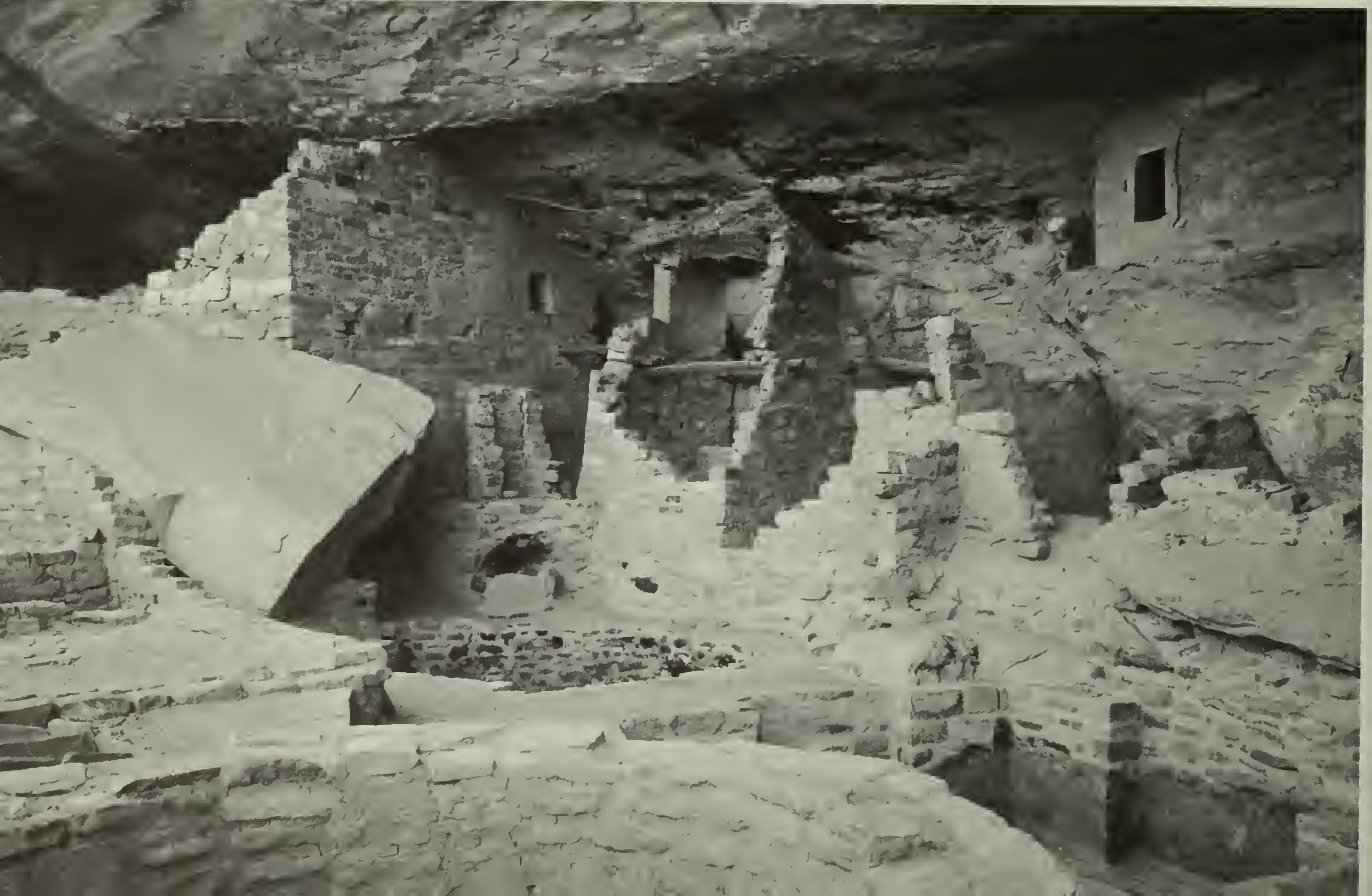


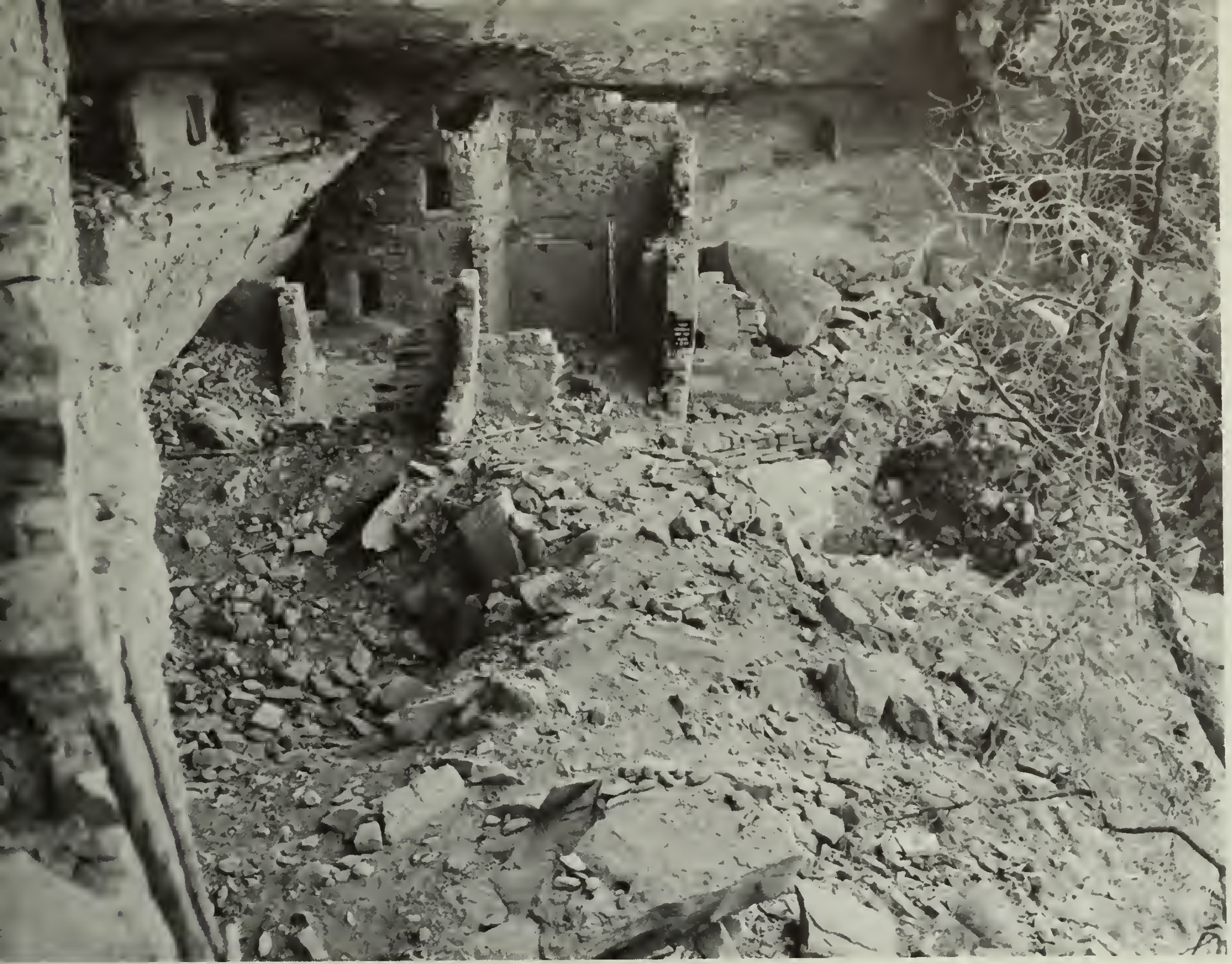
7 *Mug House (Site 1229), looking northeast. Before excavation and after excavation and stabilization.*



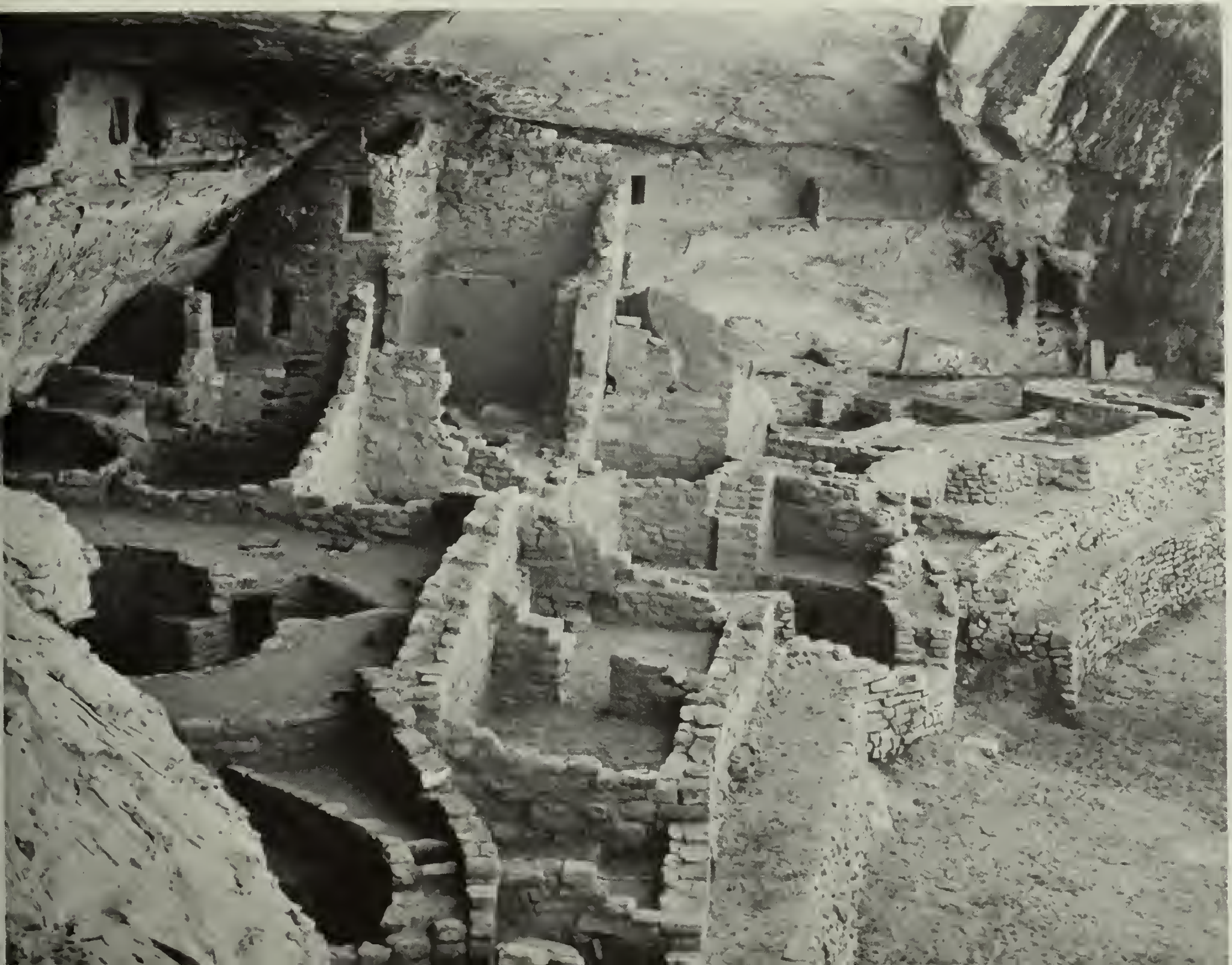


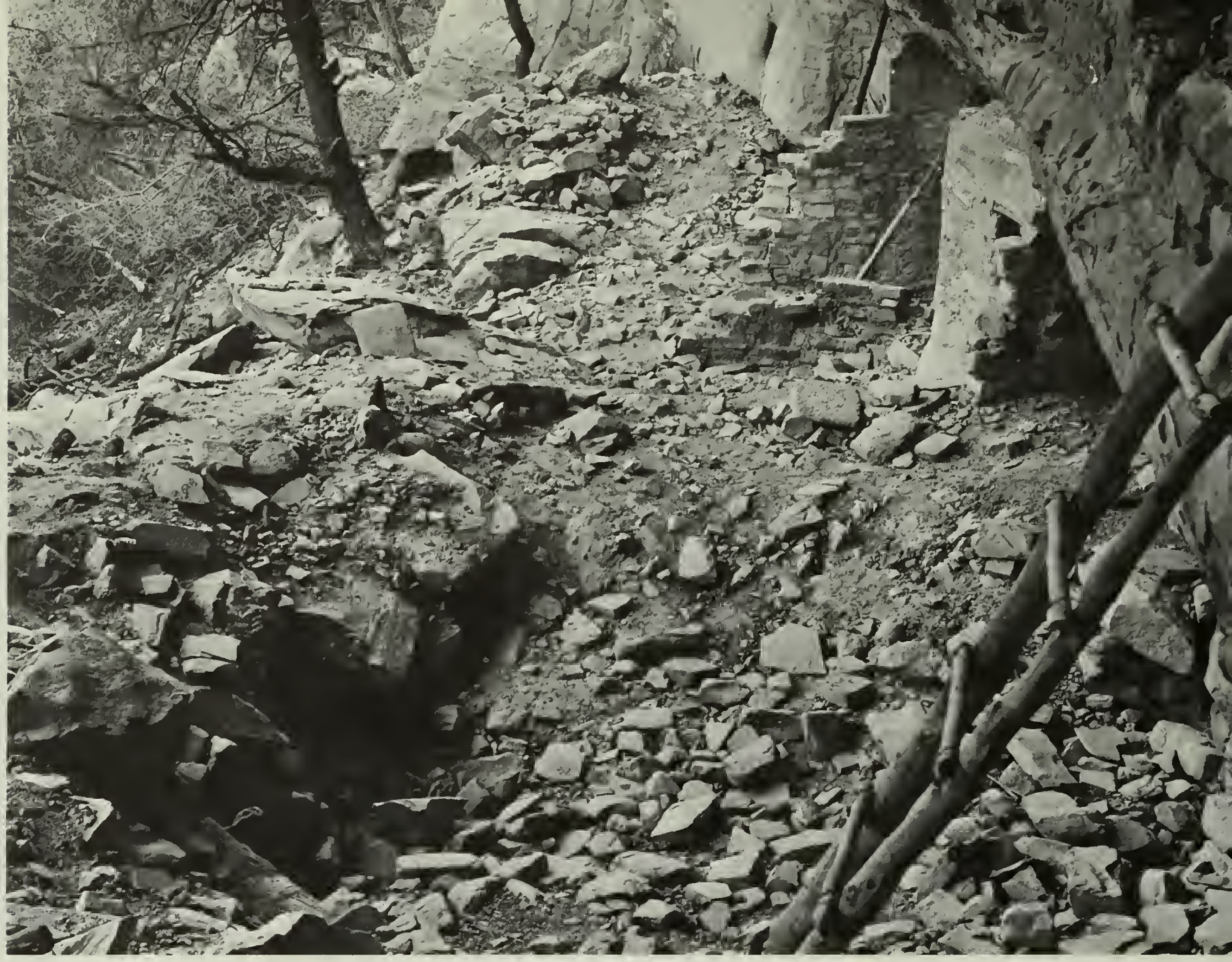
8 *South part of Mug House. Before excavation and after excavation and stabilization. Note part of south tower in foreground.*



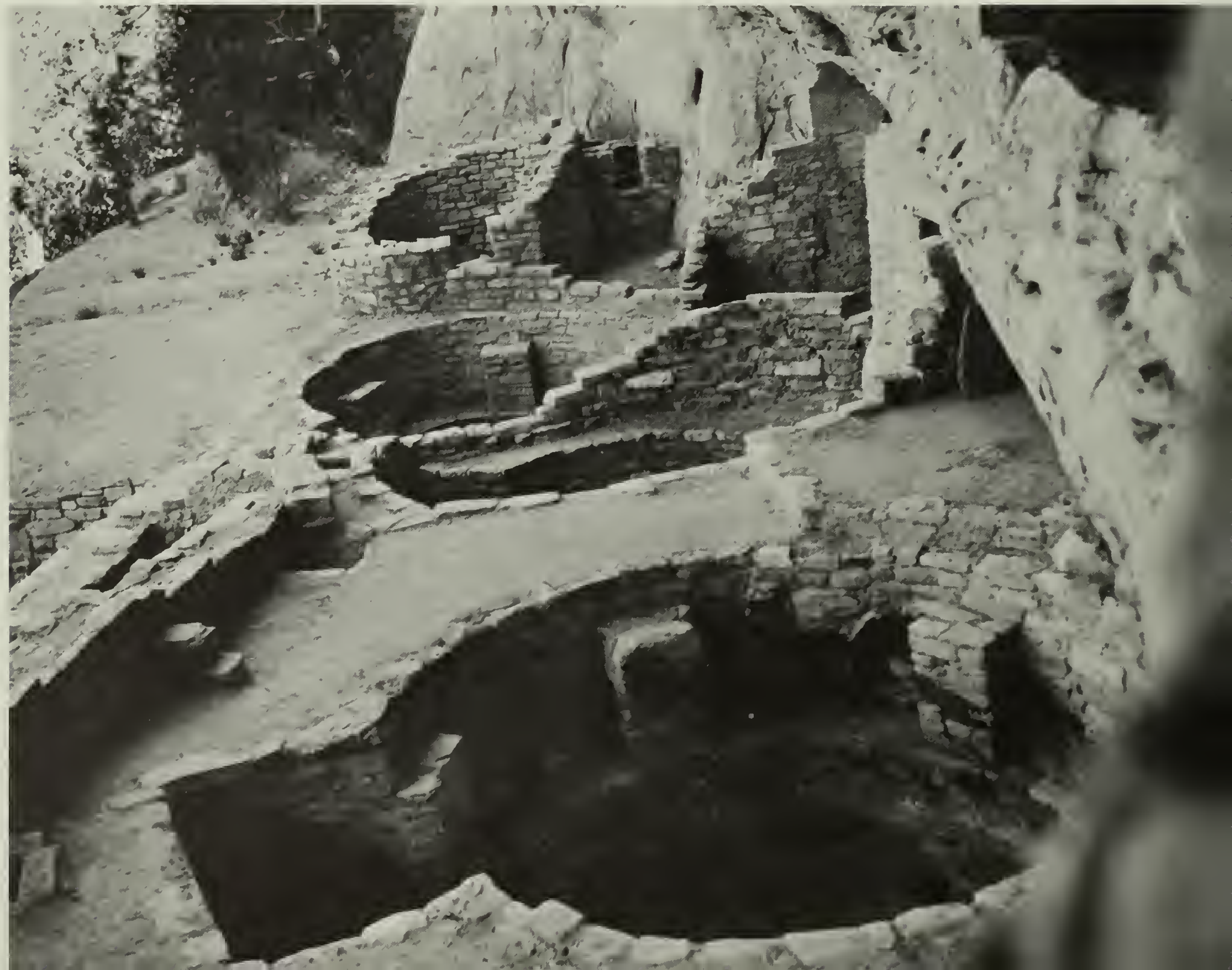


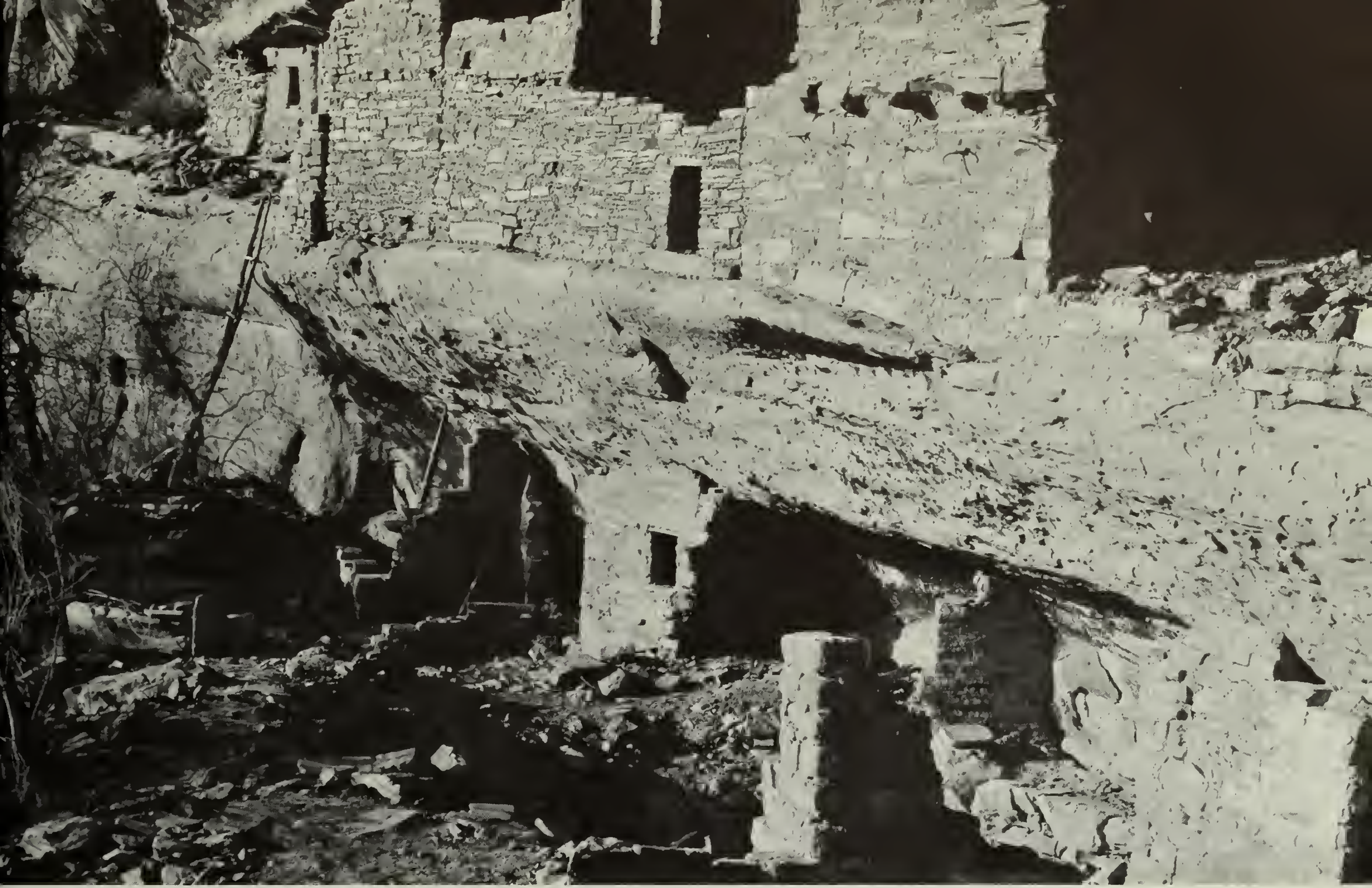
9 *Lower cave of Mug House, looking southeast. Before excavation and after excavation and stabilization.*



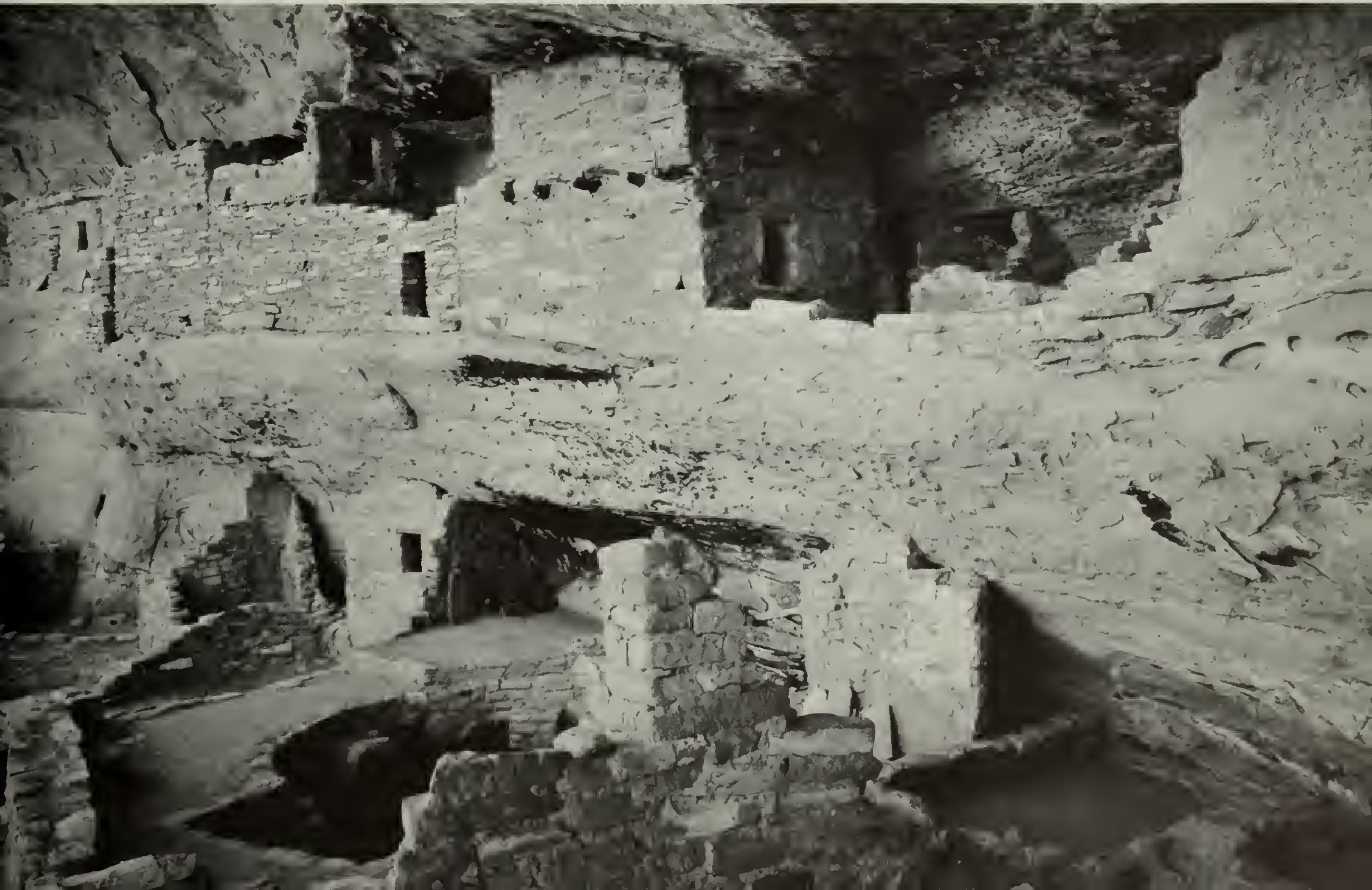


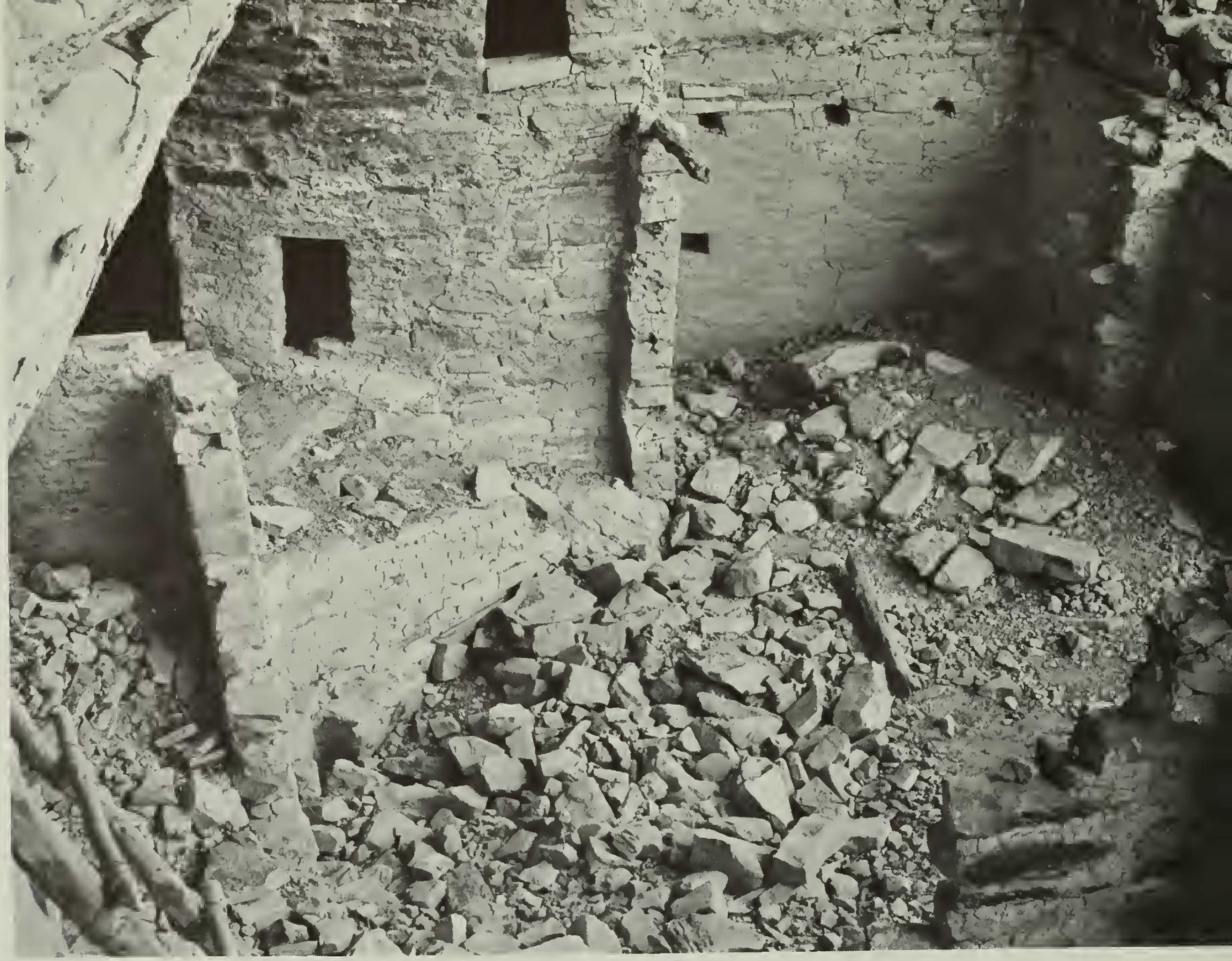
10 *Courtyards C, D, and G, front to back. Before excavation and after excavation and stabilization.*



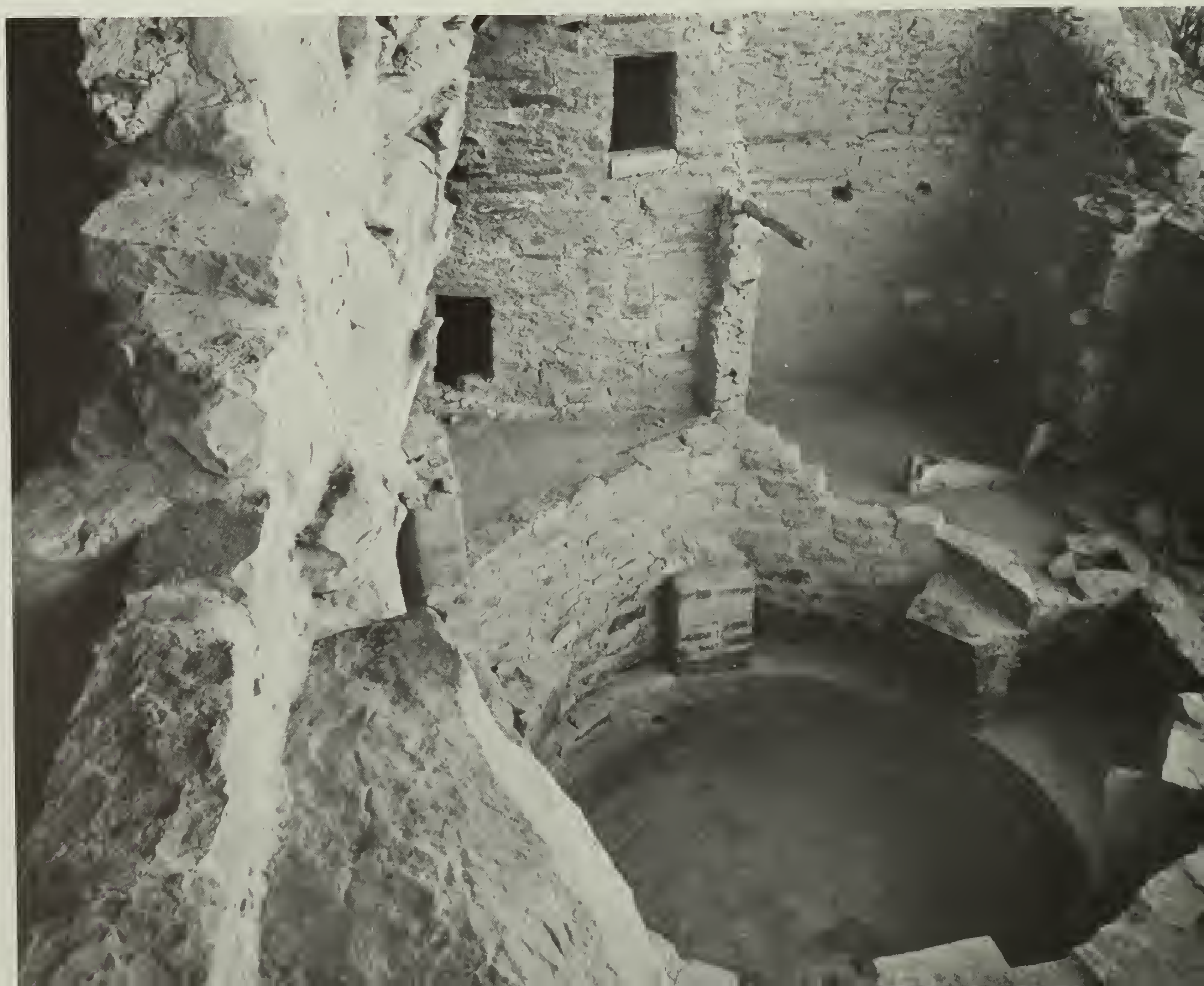


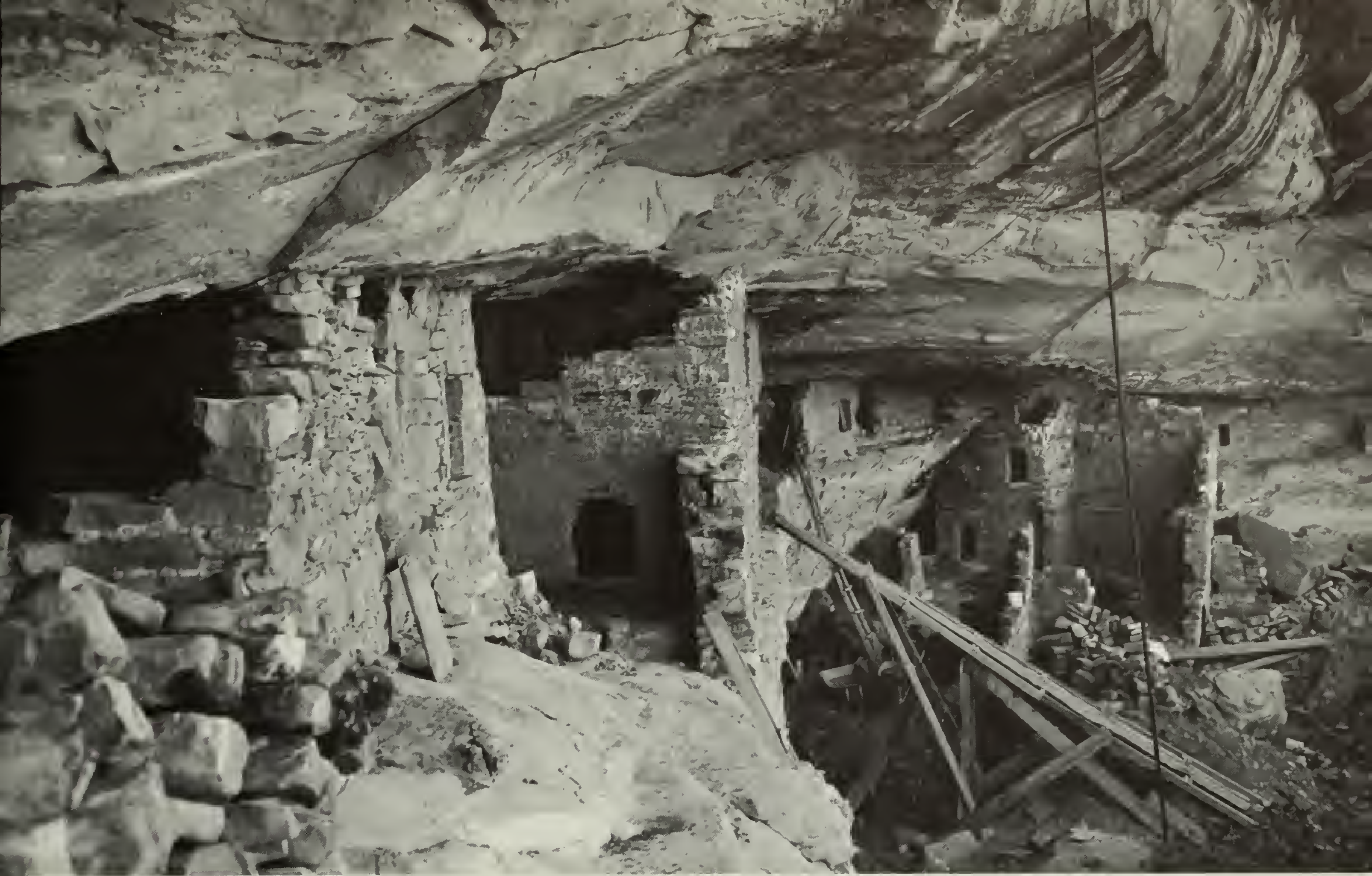
1 North part of Mug House. Before excavation and after excavation and stabilization.





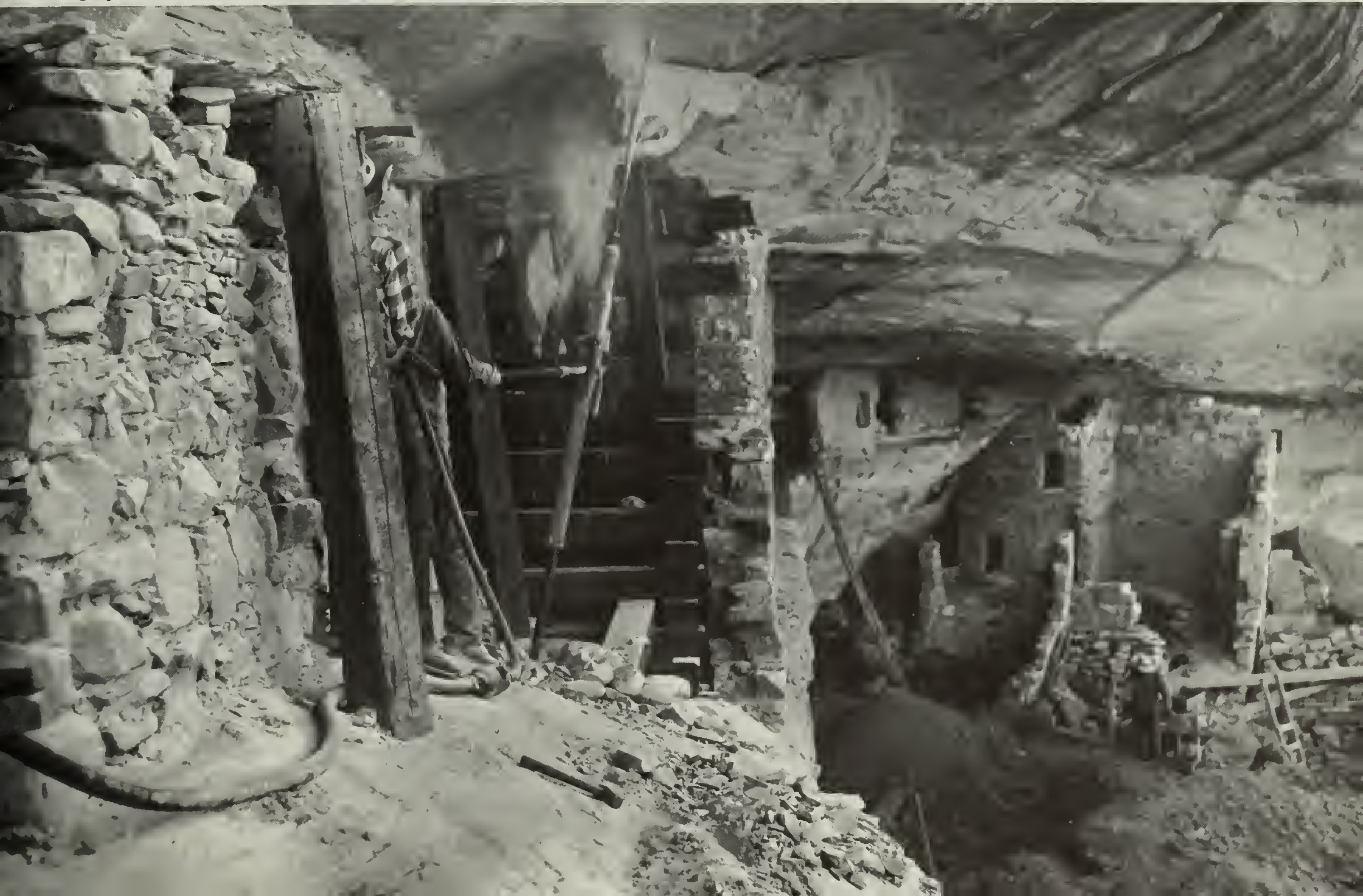
12 *Kiva B and adjacent rooms to the south. Before excavation and after excavation and stabilization.*

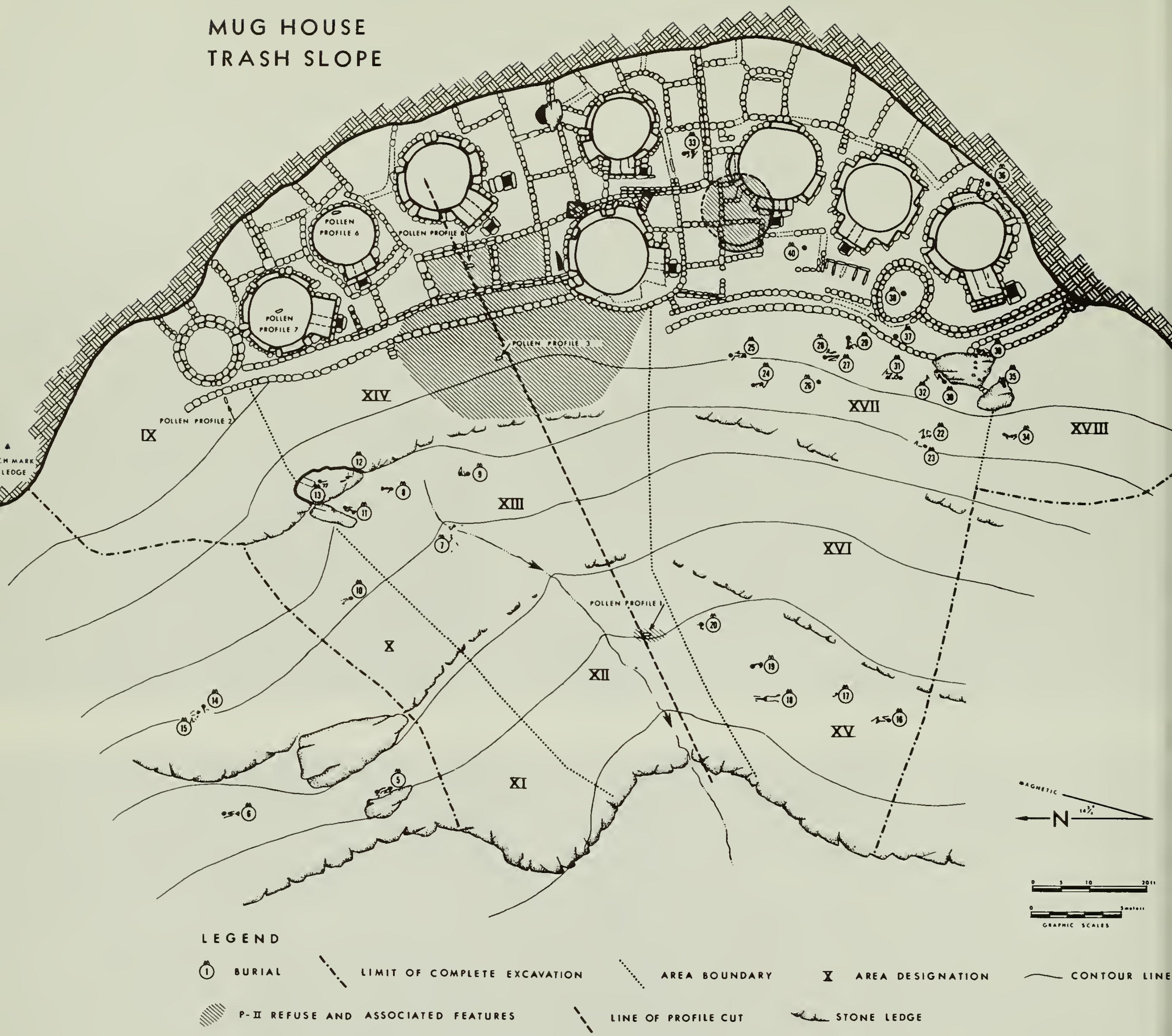




3 *Crack in sandstone roof above upper ledge in Mug House.*

4 *Removing separated sandstone slab in Mug House with a stoper.*




MUG HOUSE
TRASH SLOPE
POLLEN PROFILE 6
POLLEN PROFILE 7
POLLEN PROFILE 8
POLLEN PROFILE 3
POLLEN PROFILE 2
POLLEN PROFILE 1
IX
X
XI
XII
XIII
XIV
XV
XVI
XVII
XVIII
MAGNETIC
N
14½°
GRAPHIC SCALES
LEGEND
BURIAL
LIMIT OF COMPLETE EXCAVATION
AREA BOUNDARY
AREA DESIGNATION
CONTOUR LINE
P-II REFUSE AND ASSOCIATED FEATURES
LINE OF PROFILE CUT
STONE LEDGE

15 Mug House trash slope, showing subdivisions and distribution of burials.

separated from the solid roof by a crack (fig. 13). This loose slab endangered a spectacular part of the ruin, our workmen, and future visitors. Jack Brinkerhoff, a miner from Durango, Colo., was hired to remove the slab. With the aid of the Mug House crew, he lowered more than 100 railroad ties into the ruin to construct cribbing around the threatened walls. He first broke off chunks of the slab using sledge hammers and a bar. The main part was then cut with a stoper—a jackhammer used in mines for overhead work. Altogether, he removed about 10 tons of loose sandstone without damaging any of the walls (fig. 14).

The immense quantities of rainwater that periodically spilled over the cliff onto the front portions of the ruin provided another natural threat to our handiwork. In an effort to stop this, we constructed diversion channels and ditches to direct the runoff toward the ends of the cave, where it would not strike any walls. This new drainage pattern caused many previously secure boulders to be "relocated" farther down the canyon sides during the heavy summer rains, and partly undercut a large sandstone boulder, weighing an estimated 110 tons, perched above the south entrance to the cave. Park engineer Lewis D. Anderson and crewman J. L. Goff, using hydraulic jacks, pushed boulder into the canyon.

The report presented to the Colorado Historical Society by the Wetherills' brother-in-law, Charles Mason, describing the richness of their finds in Mug House was substantiated by our own excavation. And while the number of perishable artifacts unearthed proved disappointingly small, we were rewarded by plentiful finds of pottery and bone and stone objects. In addition, the architecture was sufficiently preserved in most places to permit speculations concerning some nonmaterial aspects of the culture of the Muguenos.

ARCHEOLOGICAL SEQUENCE

The refuse dumped by the ancient housekeepers of Mug House along the front of the cave and down the slope below provides the basis for a picture of several sequential occupations by the prehistoric Pueblo Indians. Our stripping operation through this rubbish (fig. 15) not only produced a vast quantity of discarded tools and utensils, but also revealed a clear stratification of refuse layers adjacent to the ruin. The lowest levels of refuse actually passed beneath the outermost rooms.

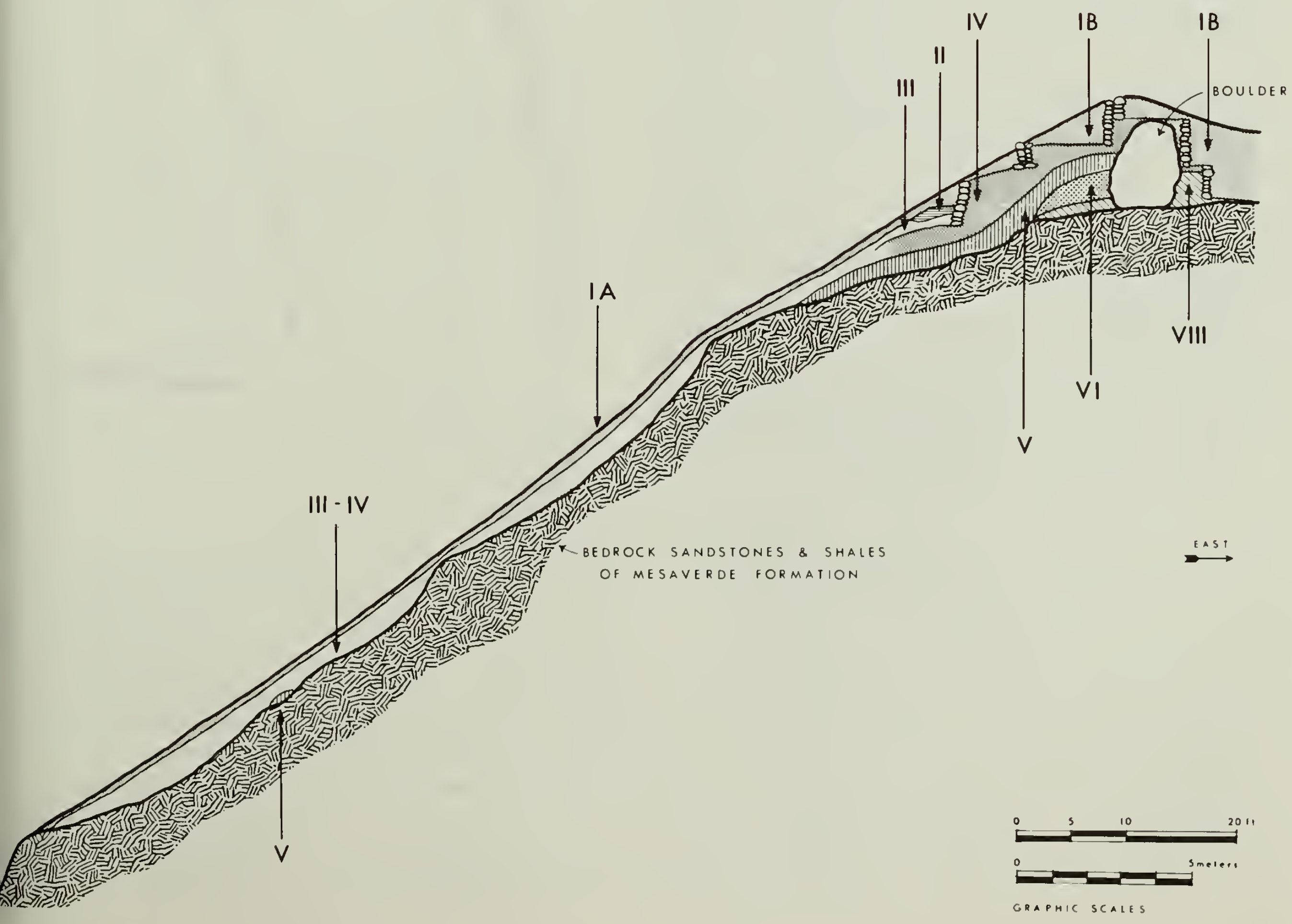
Figure 16 is a schematic section of the trash slope looking north. Seven deposits were distinguished in profiles from Rooms 62 and 63 and from the upper end of the dump near the retaining walls. Layers IA and IB are accumulations of rubble and debris from walls and roofs of buildings as they succumbed to the destructive forces of nature when humans no longer occupied them. Layer IA capped the refuse deposits on the slope, while Layer IB filled rooms and kivas. Specimens found in these two deposits undoubtedly represent the latest occupation.

Layers II and III contained essentially undisturbed refuse, also belonging to the latest occupation or component. Pottery and tools from this trash duplicated those found in the buildings and in Layer I in every respect except completeness. The line of separation between Layers II and III appeared to mark some intense building activity.

Layer IV proved to be the hardest to understand. At first we considered it to be a mixture of later refuse with earlier materials brought about by leveling activities of the later builders. Laboratory analysis of its ceramics revealed, instead, a transitional assemblage typical of early Pueblo III mesa-top sites. Further evidence of this sort came from close examination of the architecture, which indicated that the first parts of Mug House proper to be built probably date to this transitional period. We then noted that an obviously mixed zone found on the upper ledge differed markedly in character from Layer IV. Thus this trash slope layer must represent a refuse deposit that passes beneath the outer walls of Mug House and agrees well in position with the placement of the houses whose inhabitants apparently are responsible for its existence.

Layer V effectively forms the basement of the trash slope, resting directly on bedrock in several places. It, too, passes under the outermost buildings. The ceramic content is one normally associated with late Pueblo II

16 *Schematic profile of the Mug House trash slope.*



mesa-top structures of chipped-edge stone masonry, and is quite distinct from that of the overlying strata. The few later sherds, listed in table 3, could have been mixed in by workmen trying to follow the lines of demarcation between the levels, or even by burrowing rodents. A pocket of similar refuse appeared far down the slope.

Beneath the floors of Rooms 62 and 63 we encountered still another deposit, 2½ feet thick, below Layer V. Only a few sherds and specks of charcoal set it apart from sterile earth. It seems likely that this layer, designated number VI, was intentionally built up as a living space by the persons responsible for Layer V trash. Sterile sand (Layer VII), angular talus rocks, and occasional outcrops of bedrock sandstone and shale underlay the trash dump.

From this stratigraphic series, three components, designated A, B, and C, early to late, are distinguishable. It is possible to associate certain architectural features with the refuse layers and to partially characterize the cultural content of each component. As might be expected, the vigorous activity of the latest and best represented component obliterated major parts of the two earlier ones.

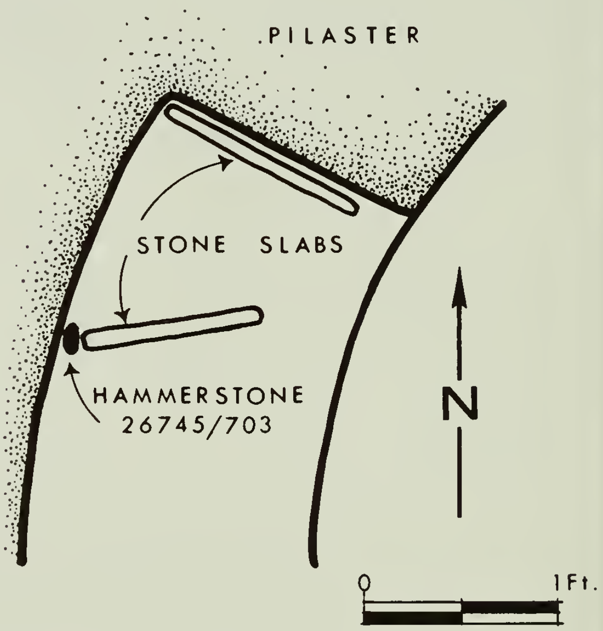
Component A. The refuse deposit for this occupation makes up Layer V of the trash slope. All other features can be associated only by inference. No actual house was found, but parts of two rectangular slab-lined pits (apparently hearths), a masonry kiva, and two burials can be correlated with the refuse deposit on the basis of pottery and relative position (fig. 15).

One slab-lined pit lay 4.5 feet beneath the southwest corner of Room 31. It was dug 1.6 feet deep into sterile yellow sand from a layer of fire-reddened sand and lumps of sandstone that averaged less than half a foot thick. Thin sandstone slabs were set upright in mud mortar to form three sides, two slabs to the side; the fourth side was missing. The inside measured 2.0 by 1.7 feet. The pit contained a thin layer of white ash and charcoal. It was covered by 2½ feet of redeposited yellow sand and sandstone with some mixture of charcoal and fire-reddened rocks, and by 1½ feet of rocky debris containing Pueblo III sherds.

The second pit was exposed immediately beneath the floor of Room 73/1 and was filled with a brown, sandy trash including a small lens of ash and charcoal. Inside dimensions were 2.3 by 1.8 feet and 1.3 feet deep. There is some possibility that the occupants of Room 73/1 re-used this pit, but its original construction and use predated construction of the room. I have included both pits in the earliest component because they occurred at approximately the same level, well below the building unit associated with the succeeding component.

Beneath the floor of Room 78 we encountered part of the wall of a partially destroyed masonry kiva that contained in its deepest fill a ceramic assemblage identical to that found in the refuse deposit. The middle level contained a mixed assemblage not unlike that of the succeeding component, while the upper level was devoid of sherds. This top 2.7 feet consisted of yellow and orange sand formed by the disintegration of Mesaverde sandstone, and of chunks of sandstone, a scattering of charcoal flecks, and pieces of fire-reddened sandstone which had been redeposited, apparently by men digging a nearby kiva. This material also served to raise the level of the ground on the west side of Kiva E nearly to roof height.

Two factors prevented the excavation of the entire kiva: (1) the need to preserve overlying walls and structures for exhibit, and (2) its partial destruction by the building of Kiva E. No floor features were uncovered, but the floor itself consisted of a 0.04-foot-thick layer of red clayey-loam, which curved upward into the wall plaster. The walls were built of sandstone blocks with naturally flat or crudely spalled faces. These were set in a reddish-brown mud mortar sparsely chinked with small sandstone spalls. A single pecked-face stone occurred in one of the pilasters. At least five coats of monochrome plaster, ranging in color from a whitish-gray to dark brown, were counted on the lower wall. A banquette, averaging 1.5 feet in width, stood 2.7 feet above the floor. Against the side of one pilaster was a small quadrilateral slab cist about 0.6 foot high (fig. 17). The two slabs shown may once have been topped by a third. The spacing indicates an original total of six pilasters, although only two were found. One was parallel-sided, 2.0 feet wide and stood at least 1.5 feet high above the banquette.



17 *Plan of slab cist on banquette of Component A kiva in Mug House.*

On the floor and the banquette were found a mano, a hammerstone, a utilized flake, a stone core, two stone flakes, and what may be a bone side scraper.

Burial M33 lay 4.3 feet beneath the floor of Room 37/1, close to the level of the two slab-lined pits. This interment was apparently made prior to the artificial building up of fill on which Room 37 and its associated rooms were constructed. The pottery found with Burial M21 marks it as part of this component, although the grave lay about 50 yards north of Mug House cave.

None of these features could be dated through direct association with materials other than ceramics. Indirect evidence suggests that several of the dated wood specimens from Mug House were originally cut for use in the structures of the earliest component. We found no actual remains of a house, but the relative positions of the trash dump, the kiva, and two outdoor hearths indicate that such a building once stood in the area now occupied by Kiva B and the rooms adjacent to it on the north. Apparently this early house was razed, as were the upper kiva walls, by the builders of the first Component B rooms, and the earliest rooms forming a part of Mug House as we now see it. These Component B builders partially refaced the old chipped-edge building stones by pecking before incorporating them in the walls of Rooms 10, 11, and 12, and they set old smoke-blackened timbers into the roof of Room 15 with the smoke stain *on top*. Even if Room 15 contained a hearth, and it did not, smoke staining would be expected on the undersides of the roof beams.

The range of tree-ring dates for Mug House does not represent the entire span of its occupation. The 39 outside dates cover a span of 541 years, from A.D. 736 to 1277 (table 1). Seven of the earliest dates come from Kiva E, which could not have been built earlier than 1259. They must represent, therefore, timbers salvaged from older buildings or cut from dead trees. Furthermore, three of the 11th-century dates are from *in situ* roof beams, known to have been re-used, in Room 15/1. Thus we must consider all those dates prior to at least 1075 as coming from re-used logs.

Table 2 shows that 14 dates fall in the 1000's. An especially tight clustering from 1063 to 1076 suggests that these timbers had been salvaged from a single small house site. Six of these came from proveniences attributable to Component B, whose builders seem to have re-used other Component A building materials as well. The other eight are from unassignable locations.

The Component A buildings were apparently dismantled to salvage their building material. Their immediate successors, the first buildings of Component B, contain many re-used building stones of the kind probably employed in the original Component A house and a

TABLE 1.—DATES DERIVED FROM MUG HOUSE TREE-RING SPECIMENS

Specimen No.	Provenience	Species	Date A.D.	
			Inside	Outside
MV–1023	Kiva D, ventilator fill.	DF	682p	736r
MV–1429–2	Kiva E, fallen roof.	DF	673	743vv
MV–1404	.....do...........	DF	660p	803v
MV–1429–1	.....do...........	DF	696	831v
MV–1416	.....do...........	DF	756	848vv
MV–1407	.....do...........	DF	733np	873vv
MV–1433	.....do...........	DF	711np	882vv
MV–1390	Kiva E, fill.......	DF	694	963vv
MV–1379	Kiva F, fill.......	Pnn	947p	987r
MV–1403	*Room 15/1, roof.	DF	959p	1011r
MV–1183–1	Kiva B, fallen roof.	DF	964np	1022r
GP–4490	*Room 15/1, roof..	DF	928np	1033cL
MV–1485	*Room 12/1, roof..	DF	913p	1034cGL
MV–1028	Surface...........	Jun	874np	1042r
GP–3797	?................	Jun	880np	1055v
MV–1156	Surface, Room 35..	DF	967p	1063cL
MV–1177	.....do...........	DF	845p	1064L
GP–4489	*Room 15/1, roof..	DF	947np	1066cL
MV–1158	Surface...........	DF	886p	1066cL
MV–1159	.....do...........	DF	855p	1066L
GP–3798	?................	DF	847p	1073cL
GP–4501	?................	DF	890p	1075L
MV–2339	*Room 15/1, doorway lintel.	Jun	1014np	1075vv
MV–1334	Backdirt over Kiva D	DF	890p	1076r
MV–2340	*Room 15/1, doorway lintel.	Jun	1000	1078cL
MV–2341	.....do..........	Jun	1015np	1078vv
MV–1337	Backdirt over Kiva D.	DF	930np	1108G
MV–1160	Surface...........	DF	1122p	1204L
MV–1394	Kiva E, poss. fallen roof.	Pnn	1165np	1228+v
GP–3795	?................	Jun	1118p	1230vv
MV–1183–2	Kiva B, fill.......	DF	1179p	1231r
GP–3799	?................	DF	1052p	1232v
MV–1172	Surface, south portion.	DF	1052p	1241vv
MV–1398	Surface...........	Jun	1144np	1241L
MV–1414	Kiva E, fallen roof.	Pnn	1166	1246vv
MV–2343	Room 11/2, south door lintel.	Jun	1200np	1250cL
MV–1406	Kiva E, fallen roof.	Pnn	1164np	1259r
GP–4491	*Room 36/2, roof..	Pnn	1193	1262v
MV–2357	*Room 9, west wall.	DF	1109	1277v

Key:

MV Specimens were cataloged in the collections of the Laboratory of Tree-Ring Research at the University of Arizona, Tucson.

GP Specimens were collected by Deric Nusbaum (O'Bryan) of Gila Pueblo in 1941, cataloged by that institution, and eventually donated to the University of Arizona. These specimens have been reexamined by Robert F. Nichols, of the Wetherill Mesa Project, and corroborated or revised dates are given here. Nichols has published the Mug House dates since this list was compiled (Nichols and Harlan, 1967).

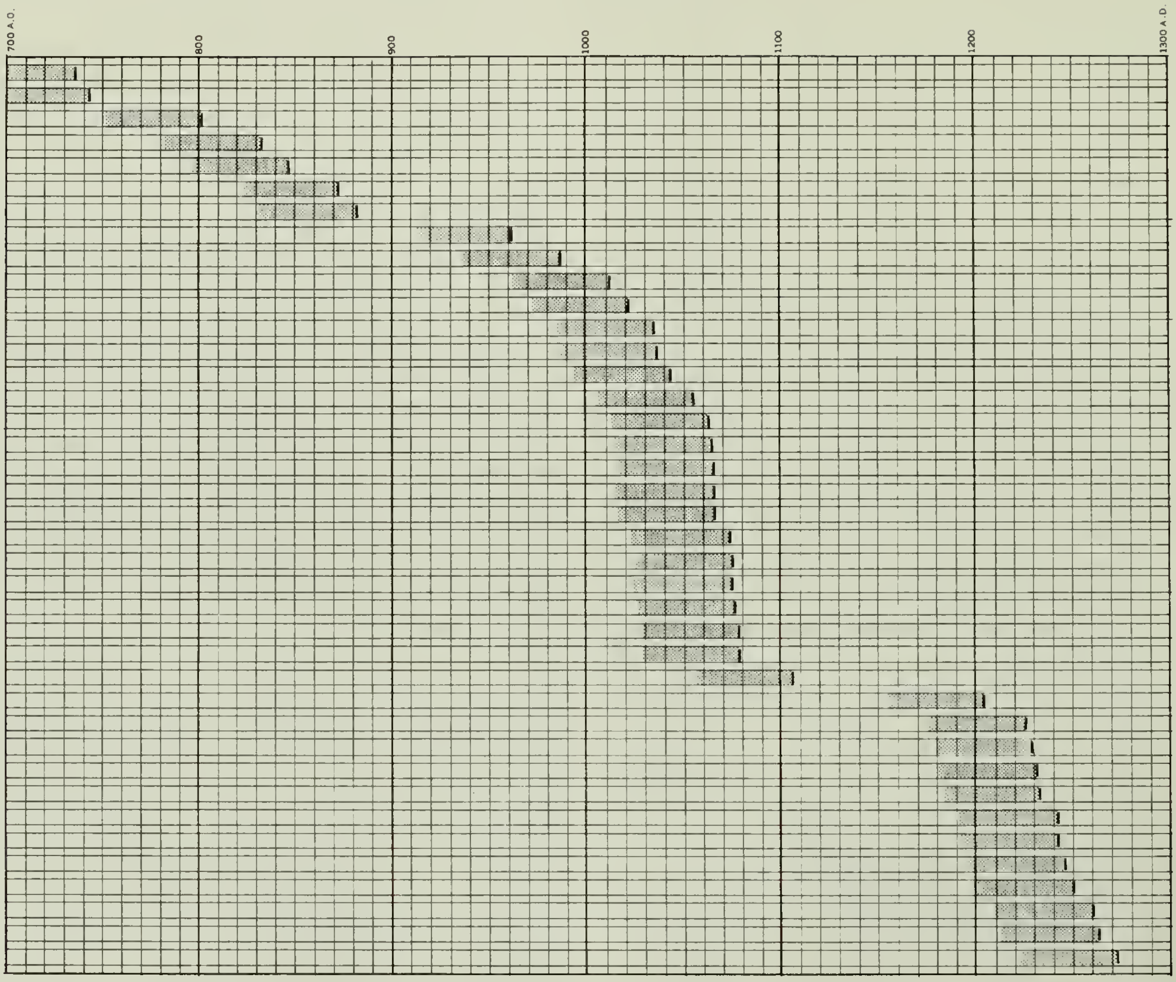
Species DF—Douglas-fir
Pnn—Pinyon
Jun—Juniper

Provenience *—*in situ* specimen

Dates Inside rings:
p—pith ring present
np—pith ring not present, innermost ring probably near pith

Outside rings:
v—outermost ring variable around circumference due to erosion
vv—outermost ring very variable due to extreme erosion
r—outer ring constant over significant portion of circumference
c—outer ring constant around entire circumference
+—outer rings tight, possibly one ring absent from series
L—outside surface uniform in color and texture
G—bark beetle galleries present on outside

TABLE 2.—CLUSTERING OF TREE-RING DATES FROM MUG HOUSE



number of re-used timbers originally cut for use during the 1000's. Therefore, it seems justifiable to conclude that the tight cluster of 11th-century dates applies to the construction and occupation of the Component A house.

We can say, then, that the initial permanent occupation and use of Mug House cave consisted of one small house unit built of chipped-edge stone masonry, one kiva, and a ceramic assemblage in which Mancos Black-on-white and Mancos Corrugated predominated, and that this occupation occurred just after the middle of the 11th century. All these characteristics occur together consistently in sites on the mesa top.

The artifact inventory of Component A is relatively short. Table 3 lists the sherd counts for all the deposits mentioned above, using type names described by Abel (1955) with a few modifications. In addition, only three restorable vessels were found, two of them in the grave of Burial M21. All three are Mancos Black-on-white; two have organic paint. Two charred corncob fragments represent the only perishable objects.

TABLE 3.—COMPONENT A SHERD COUNTS

Mesa Verde B/W	13
Indeterminate-McElmo-Mesa Verde B/W	31
McElmo B/W	23
Mancos B/W with organic paint	43
Mancos B/W with mineral paint	184
Cortez B/W	4
Chaco B/W	1
Mesa Verde Corrugated	9
Indeterminate corrugated	638
Mancos Corrugated	88
Mancos Gray	1
Chapin Gray	48
Plain sherds from B/W vessels	139
Undecorated White Ware	1
Unclassified B/W	81
Miscellaneous unclassified	52
Total	1, 356

Thirty-six stone artifacts include 1 drill, 1 scraper, 1 chopper, 11 hammerstones, 4 manos, 1 rubbing stone, 13 utilized flakes, 1 utilized core, 1 ground sandstone tablet, 1 pot support, and 1 waterworn cobble. Three of the manos are of the kind used in troughed metates; the other was used with a plain-faced metate. Eleven utilized flakes (four of which are blades) showed use as cutting tools: another has a dulled edge, and another had been used both in scraping and in engraving. Three bone tools include an awl with transverse groove, a reamer, and a possible side scraper, all made from split fragments of artiodactyl bones.

Component B. Recognition of this component depends on the persistent appearance of rubbish deposits bearing consistent ceramic assemblages, easily distinguishable from the abnormal associations of mixed deposits. Layer

IV in the trash slope and several of the subfloor strata represent the refuse dump. The upper part of the Component A kiva was filled with similar debris. No architectural features are clearly associated with this refuse, but several structures of the standing ruin may be contemporaneous with it, judging from their position.

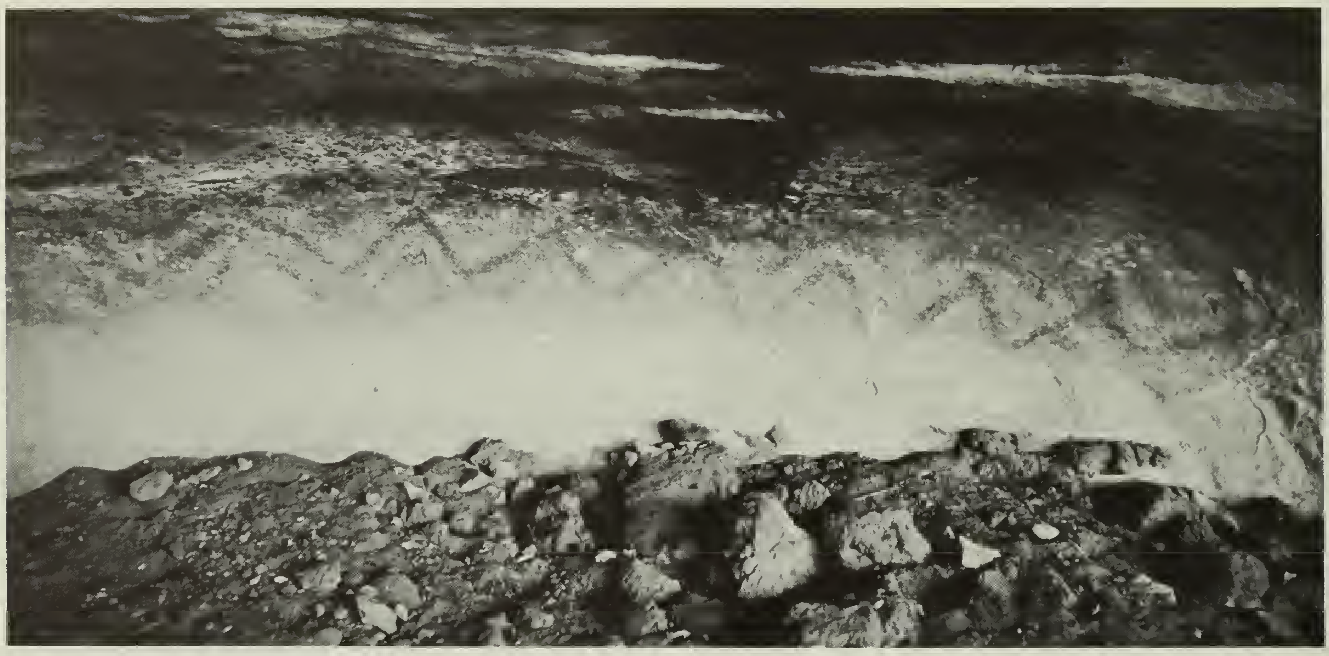
Wall abutments indicate that the earliest rooms built on the upper ledge formed a straight row along the front of that ledge directly above the earliest structure, Kiva D, in the lower cave. The arrangement of this unit—probably including Room 25—resembles that commonly found at sites on the mesa top during the 11th century (fig. 39). Many stones and beams from an earlier house, presumably belonging to Component A, were re-used. Thus, construction must have begun after the latest date derived from these materials—A.D. 1066 from a roof timber in Room 15/1. Three poles in the lintel over the doorway of this same room produced dates of 1075, 1078, and 1078. (One date of 1108 came from a pole found in backdirt thrown from this upper ledge unit during past digging.) It seems likely that at least one and perhaps all of these rooms were built in 1078 or shortly thereafter.

Presumably after this unit was built, and definitely after the razing of the Component A house, a typical unit-type pueblo was constructed with Kiva B at its center (fig. 38). This pueblo's layout and place within the Mug House building sequence suggest that it was built during the 1100's, although there are no 12th-century tree-ring dates from *in situ* specimens.

Various spaces in both of these room blocks with their attendant kivas show signs of remodeling, realinement with newer rooms, re-occupation after fire, and complete abandonment, followed by a filling with refuse from still inhabited neighboring rooms. It is possible that some rooms and units were added to these as part of Component B, but I think that the later growth and elaboration of Mug House took place during the succeeding Component C. This means drawing an arbitrary line between two parts of a continuous occupation, which can only be justified by the obvious changes in ceramic content found in the trash heap and by the shift in settlement plan, discussed more fully in the following chapter.

If these two house units belong with Layer IV trash, they were probably contemporary with similar units

18 Site 1227, showing area where structures were razed by the Indians for materials used elsewhere.

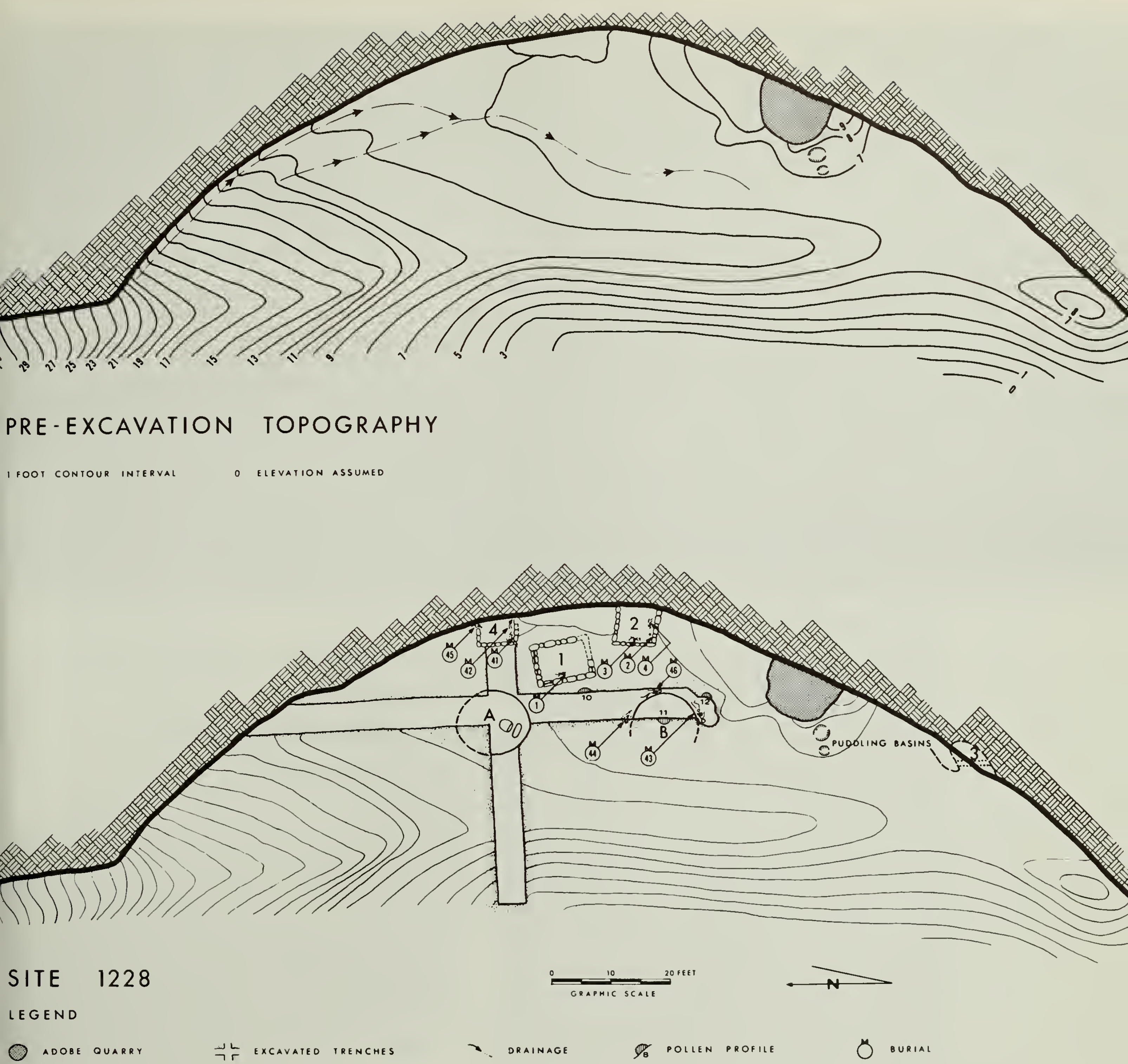


19 *Painting on back wall of cave at Site 1227.*

in neighboring Adobe Cave (Site 1228) and Site 1227, within 100 yards to the north. No standing walls remain at Site 1227 (fig. 18). Smoke blackening and mud lines indicate the former presence of about six to eight rooms, with at least one 2-story building. Less than 1 foot of fill presently covers the room floors. Three parallel zigzag lines, painted in red, adorn the backwall of the cave at its deepest part (fig. 19). The complete absence of standing walls and the rubble from fallen ones in this well sheltered cave (perishable goods were recovered during testing) leads to the conclusion that the houses were purposely torn down, perhaps even by their former occupants, and the materials used in building elsewhere.

In Adobe Cave (fig. 20), trenching through recently deposited sediments revealed remnants of three rooms and two kivas (fig. 21), all of them robbed of most of their building materials. For both kivas, the Indians had dug pits into earlier laminated deposits and then lined them with pecked-face sandstone masonry employing reddish-brown and brown mud mortar, without chinking. Parts of two pilasters left in Kiva A indicate there were originally six. Both are set about 0.1 foot back from the edge of the banquette and have parallel sides. Kiva B had at least one niche and two coats of plaster.

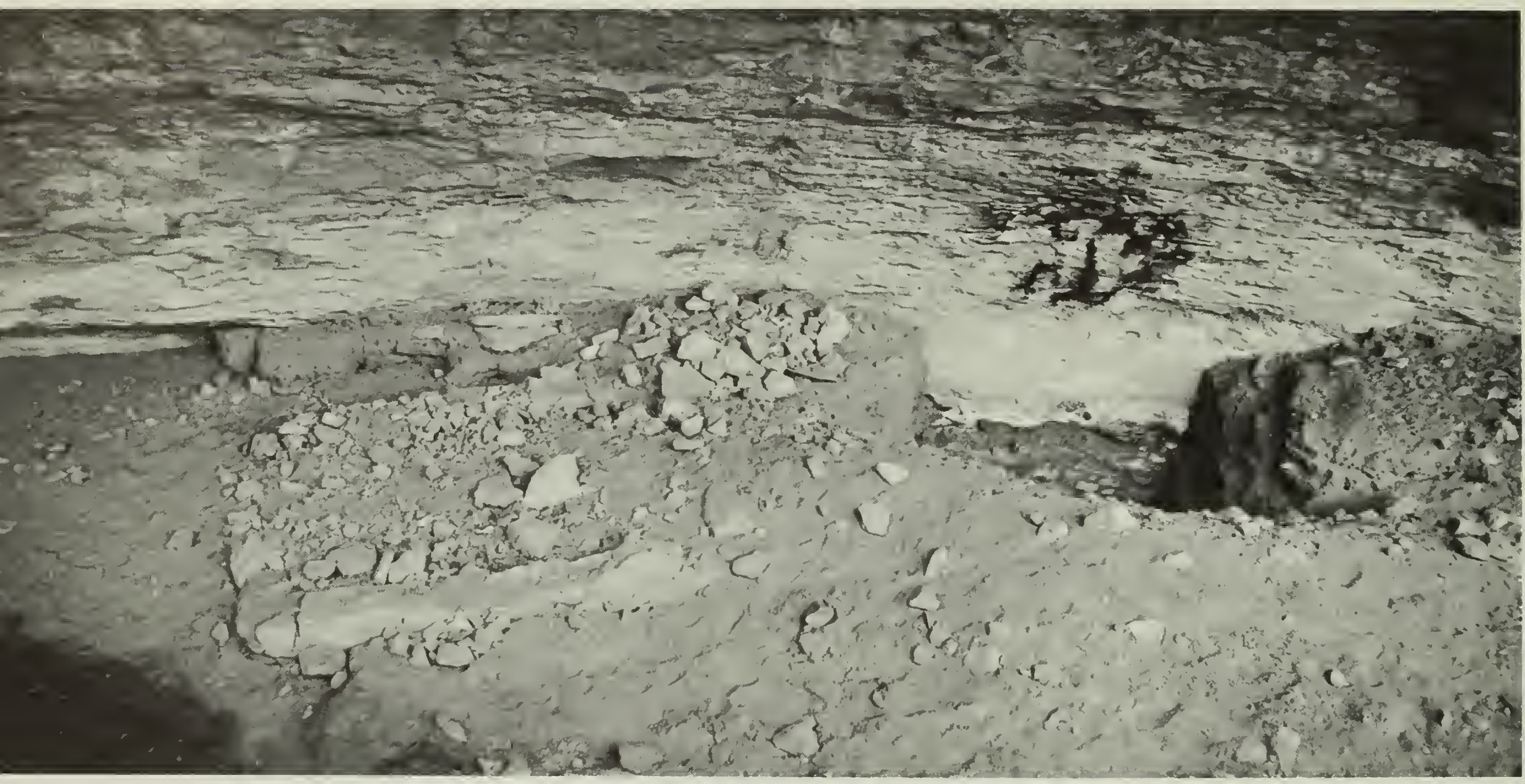
20 *Adobe deposit in Adobe Cave (Site 1228).*


29
27
25
23
21
19
17
15
13
11
9
7
5
3
1
0
PRE-EXCAVATION TOPOGRAPHY
1 FOOT CONTOUR INTERVAL
0 ELEVATION ASSUMED
4
2
1
A
B
3
45
42
41
3
2
4
46
1
44
43
10
11
12
PUDDLING BASINS
SITE 1228
0
10
20 FEET
GRAPHIC SCALE
N
LEGEND
ADOBE QUARRY
EXCAVATED TRENCHES
DRAINAGE
POLLEN PROFILE
BURIAL

21 Adobe Cave.

Floors in both structures were made with brown-colored mud smoothed slightly upward toward the walls. No floor features were encountered in the one-third of the floor area of Kiva B that we cleared, but a masonry deflector and a D-shaped hearth were found in Kiva A. Low mud collars connected both ends of the masonry deflector to the kiva lining wall. The hearth measured 2 feet in diameter and had its straight side toward the deflector. Two stone pot supports lay on the floor near the hearth, and four more were behind the deflector. No sipapu was encountered in the half of Kiva A that we excavated.

Each of the rooms stood separate from the others. Room 1 is now represented by only the bottom course of single-thickness masonry set slightly into the top of sterile, water-laid sediments. These remaining building stones are only roughly shaped, and none are dressed. There is some chinking in the light brown mud mortar. Room 2 was dug 4½ feet into the laminated deposits and lined with smallish, pecked-face stones set in reddish-brown mortar without chinking (fig. 22). In Room 4, large sandstone blocks were set on edge around three sides of a shallow pit and capped by small, undressed chunks and spalls of sandstone set in a pinkish-brown



22 Rooms 1 and 2, Adobe Cave.

mud. The cave wall formed the fourth side. A small natural recess at the south end of the cave had once been walled up across the front and apparently used for storage (Room 3).

A combined sherd count for all the deposits in Mug House cave assignable to Component B is given in table 4. No burials can be isolated, and a single charred fragment of corncob represents the only perishable material. Artifacts include 1 bone awl with transverse grooves and 1 bone spatula, and 14 stone tools: 1 scraper, 1 mano (for use in a troughed metate), 1 ground sandstone tablet, 1 worked stone slab, 1 turkey gizzard stone, and 9 utilized flakes, including 2 blades. Six of these flakes showed use as cutting tools, one as a scraping implement, and one as both a cutting and scraping tool. The ninth flake has both a dulled edge and a sharp edge.

Table 5 lists the complete assemblage of potsherds and artifacts recovered by the Wetherill Mesa Project from the surface and from two small tests in Site 1227. These artifacts are not included in the totals described later for Mug House. Adobe Cave materials are listed in table 6. Except for the burials and their accompaniments, which are associated with Component C and are therefore discussed with the Mug House materials, the Adobe Cave finds may belong either to Component B or to Component C. Most of these items came from the rubble fill that accumulated as the walls of the Component B buildings were torn down.

Component C. Mug House as we now know it properly belongs only to this component, although the still standing ruin had its beginnings in the preceding one. Most of this report is concerned with aspects of this component, and the reader may assume that everything applies to it unless otherwise stated. For example, in the section on whole and restorable pottery vessels, several pots are noted to have come from older or unassignable deposits and should not be counted in the inventory of 13th-century Mug House. In the architectural chapters, Component B and Component C structures are treated together because of changes wrought by remodeling. Features clearly associated with the older component are noted in passing.

TABLE 4.—COMPONENT B SHERD COUNTS

Mesa Verde B/W	52
Indeterminate-McElmo-Mesa Verde B/W	76
McElmo B/W	65
Mancos B/W with organic paint	21
Mancos B/W with mineral paint	114
Cortez B/W	7
Chaco B/W	1
Chapin B/W	1
Mesa Verde Corrugated	30
Indeterminate corrugated	580
Mancos Corrugated	42
Mancos Gray	1
Chapin Gray	47
Plain sherds from B/W vessels	121
Undecorated White Ware	3
Unclassified B/W	57
Miscellaneous unclassified	78
Total	1, 296

Tree-ring dates applicable to this occupation are few. There are 12 dates in the 1200's, 5 from beams adrift on the surface. A pole recovered from the fill of Kiva B with an outside ring date of 1231 could have fallen from that structure's roof or from the roof of any

TABLE 5.—SITE 1227 ARTIFACT ASSEMBLAGE

Pottery:		162 sherds
Mesa Verde B/W	13	
McElmo B/W	1	
Indeterminate-McElmo-Mesa Verde B/W	3	
Mancos B/W	1	
Cortez B/W	1	
Mesa Verde Corrugated	11	
Mancos Corrugated	1	
Indeterminate corrugated	93	
Unclassified B/W	9	
Unclassified plain sherds	29	
Stone:		
Oblong hammerstone, Style 4, claystone.		
Utilized flake used for cutting and scraping.		
Utilized flake used for scraping with dulled edge.		
Tiny fragment of turquoise ornament.		
Bone:		
Unworked turkey bone.		
Unworked mammal bone.		
Perishables:		
4 corn cobs.		
5 squash seeds.		
2 feather quills.		

TABLE 6.—ADOBE CAVE ARTIFACT ASSEMBLAGE

Pottery:		108 sherds
Mesa Verde B/W	19	
McElmo B/W	4	
Indeterminate-McElmo-Mesa Verde B/W	8	
Mesa Verde Corrugated	10	
Indeterminate corrugated	42	
Unclassified	25	
Stone:		
Mano, Style *XSU2* (4 feet deep in trench W. of Kiva A).		
Mano, Style *VSU2* (Rubble fill of Kiva A).		
Grinding stone (Rubble fill of Kiva A).		
Handstone (Disturbed fill of Room 1).		
Discoidal hammerstone, Style 3, chert (Rubble fill of Kiva A).		
Discoidal hammerstone, Style 3, chert (Rubble fill of Kiva A).		
Discoidal hammerstone, Style 3, claystone (Rubble fill, Kiva A).		
Oblong hammerstone, Style 4, claystone (Fill of Room 4).		
Side notched arrow point, quartzite (Rubble fill of Kiva A).		
Stemmed projectile point, chert (Rubble fill of Kiva A).		
Utilized flake used for cutting (Fill of pit north of Kiva A).		
Utilized flake used for cutting (Rubble fill of Kiva A).		
Utilized flake used for scraping (Rubble fill of Kiva A).		
Utilized flake used for scraping (Rubble fill of Kiva B).		
Utilized flake used for scraping (Rubble fill of Kiva B).		
Utilized flake used for scraping (Rubble fill of Kiva B).		
Utilized flake with dulled edge (Rubble fill of Kiva B).		
Utilized flake with dulled edge (Rubble fill of Kiva A).		
Indeterminate side-grooved object (Disturbed fill of Room 1).		
Painted piece of sandstone (Fill of Room 4).		
37 unmodified flakes.		
Bone:		
Turkey bone awl, Style *WJ* (Rubble fill of Kiva A).		
Turkey bone awl, Style *WJ* (Rubble fill of Kiva A).		
Turkey bone reamer, Style *SN* (Rubble fill of Kiva A).		
Turkey bone reamer tip fragment (Rubble fill of Kiva B).		
Perforated mammal tibia (Rubble fill of Kiva B).		
10 unmodified turkey bones.		
23 unmodified mammal bones.		
Perishables:		
27 corn cobs.		
15 fragments of squash rind.		
7 willow mat rods.		
8 yucca strips with 2 square knots.		
Cotton yarn, Z-twist.		
Yucca twine, 2-ply Z-twist.		
Fragment of twined sandal (Rubble fill of Kiva A).		

TABLE 7.—COMPONENT C SHERD COUNTS

Mesa Verde B/W	1, 424
Indeterminate-McElmo-Mesa Verde B/W	1, 247
McElmo B/W	300
Mancos B/W with organic paint	11
Mancos B/W with mineral paint	69
Cortez B/W	3
Mesa Verde Corrugated	2, 297
Hovenweep Corrugated	9
Indeterminate corrugated	14, 449
Mancos Corrugated	56
Mancos Gray	1
Chapin Gray	79
Plain sherds from B/W vessels	1, 583
Undecorated White Ware	70
Unclassified B/W	47
Miscellaneous unclassified	700
Polychrome trade sherd	1
Total	22, 346

one of several surrounding rooms. On the other hand, it may also have been accidentally tossed into the kiva when an old excavation scar was backfilled in 1935 to help stabilize adjacent buildings. An in-place beam in Room 36/2 with a date of 1262 probably approximates the construction of that room atop the unit pueblo of Component B.

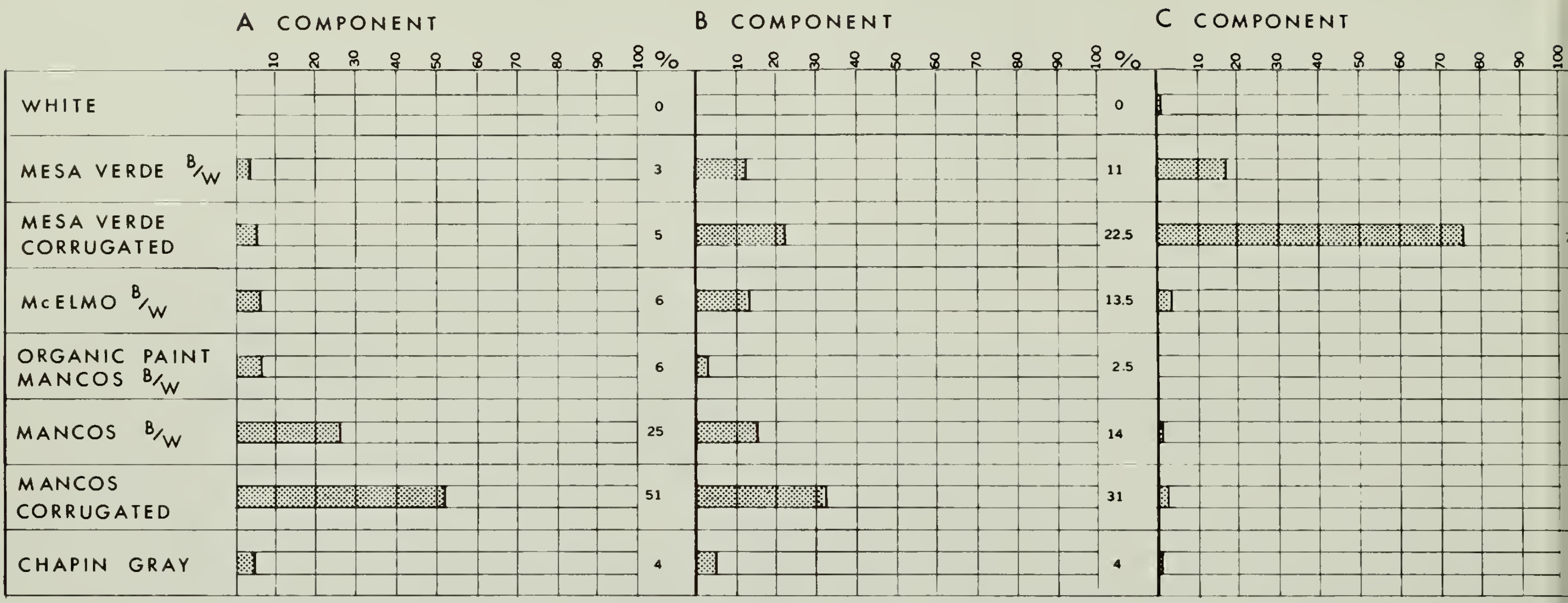
The latest of 10 different dates may indicate construction of Kiva E in A.D. 1259 (table 1). Seven of these dates are widely scattered from 743 to 963 and must represent re-use of older timbers or the collection of deadfalls. Two specimens, with outside rings dating at 1228 and 1246, had an unknown number of rings missing from their outsides. Both could have been cut about the same time as the one specimen with a probable cutting date of 1259. Kiva F, built later, yielded one date of 987, and a stray piece of charcoal from Kiva D's ventilator produced the earliest Mug House date of 736.

Dates of 1250 for a doorway lintel of Room 11/2 and of 1277 for a beam stub built into the wall of Room 9 show that people did use and build new buildings on the upper ledge throughout Component C.

We can say, categorically, that at least two structures were built about 1260, and perhaps another a decade earlier. We must fall back on dates from other presumably contemporary sites, such as Spruce Tree House (Getty, 1935) and Long House, in order to arrive at a time placement of about 1200 to 1300 for the Component C occupation of Mug House (cf. Smiley, 1951).

A count of potsherds from all indisputable Component C deposits appears in table 7. By changing the numbers of sherds in tables 3, 4, and 7 to percentages, shown in table 8, we can compare directly the relative proportions of the various pottery types making up the ceramic complex for each component. There is an obvious trend from a predominance of Mancos Corrugated and Mancos Black-on-white in Component A to a predominance of Mesa Verde Corrugated and Mesa Verde Black-on-white in Component C. McElmo Black-on-white is most common in Component B although not the most frequently represented decorated type. Chapin Gray and

TABLE 8.—RELATIVE PROPORTIONS OF POTTERY TYPES BY COMPONENT



	A COMPONENT %	B COMPONENT %
WHITE	0	0
MESA VERDE B/W	3	11
MESA VERDE CORRUGATED	5	22.5
McELMO B/W	6	13.5
ORGANIC PAINT MANCOS B/W	6	2.5
MANCOS B/W	25	14
MANCOS CORRUGATED	51	31
CHAPIN GRAY	4	4

Mancos Black-on-white with organic paint appear in small numbers only in the two earlier components. Presence of any of the earlier types in Component C may be due to heirloom specimens or to the difficulties of separating deposits in the field. This last could also account for the Mesa Verde Black-on-white and Mesa Verde Corrugated sherds in Component A.

CONSTRUCTION SEQUENCE

A variety of clues permits us to reconstruct the relative order in which most of the standing structures in Mug House were built (fig. 23). Later walls always abut earlier ones, and most upper stories were probably built somewhat later than the ground-floor rooms—at least their workmanship indicates that they were done by different individuals. Relative position toward the mouth of the shelter, or toward one of its ends, generally denotes a later date of construction. Mugueno stonemasons habitually produced a smoother face on wall exteriors by placing the largest face of each stone on that side and by paying more attention to the dressing of the stone faces to be displayed on the outside. This habit was so consistent that it is possible to determine for each segment of wall which side was intended by the builder to face outward, and in every case be compatible with other clues to the order of construction.

The lower stories of Rooms 10, 11, 12, and 15 were the first structures built on the upper ledge because all other walls abut them. Kiva D and Room 25 in the lower cave are linked to them because of relative position, the lack of other associations around them, and the fact that surrounding features also abut them. Priority has been given to this unit over that of Kiva B on the assumption that the re-used building materials in these structures came from the old Component A house which had to be dismantled before the Kiva B unit could be built. Both of these units were eventually augmented with second stories and with rooms added at the sides.

On the upper ledge to the north, Rooms 5 and 6 were built and then joined by a wall to the corner of Room 10, thus enclosing Area III. The block of Rooms 1, 2, and 3 was built next, followed by Room 4. Construction of Room 9 formed another space that was soon subdivided into Rooms 7 and 8.

Storerooms 14, 13, 55, and 56 were added in this order and at different levels as the trash accumulated in Areas III and IV. However, they followed the addition of second stories to Rooms 10, 11, 12, and 15. Rooms 55 and 56 also postdated the wall linking Rooms 6 and 10. At the south end of this ledge, Rooms 21 and 20 were built as storerooms during the expansion of the Kiva B unit before Rooms 19, 17, 16, and 18 completed the upper ledge as we know it.

Kiva C appears to have been the third kiva built, along with associated Rooms 26 and 28. Room 40 was built against the southwest corner of Room 37, probably at about the time when other construction was just beginning in the south half of the lower cave. Room 73 and Kiva A followed, before Rooms 62 and 63 were added to the north and Rooms 77, 78, and 80 were built to the south. Room 66 was next joined to Room 63, probably before any of the rooms in the Kiva G unit at the extreme north end of the shelter. To the south of the Kiva B unit, Rooms 40 and 45 seem to be the oldest, and all others, including the kivas, appear to have been constructed in order from north to south until the end of the shelter was reached. The two tree-ring dates around A.D. 1260 for Kiva E and an associated suite of rooms suggest that the south part of Mug House was constructed during the latter half of the 13th century.

ABANDONMENT

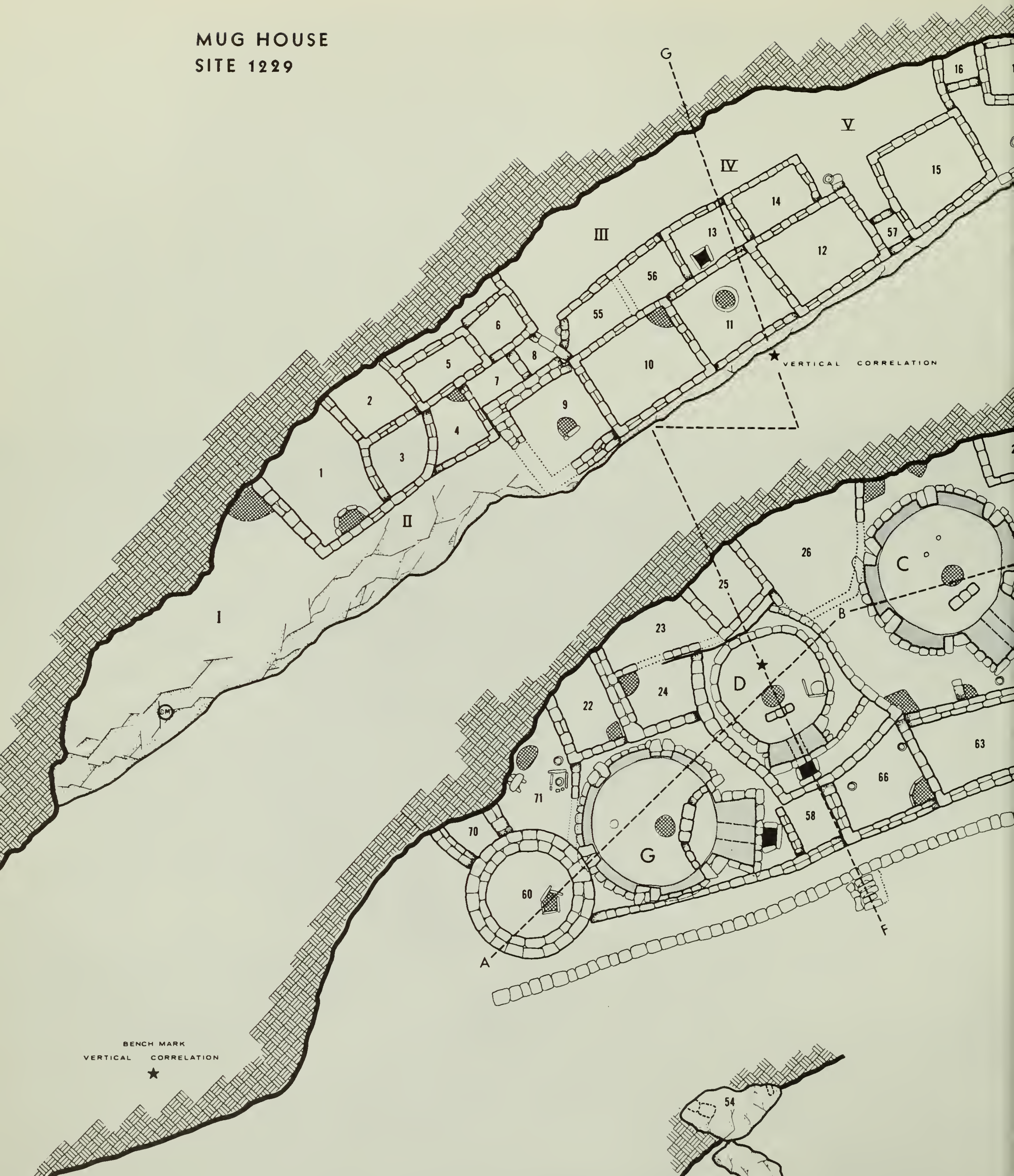
The abrupt cessation of building activity in the cliff dwellings during the late 1270's, as seen from tree-ring dates (Smiley, 1951), and the lack of post-1300 trade pottery from other areas of the Southwest point to 1300 as the approximate end for Pueblo occupation of Mesa Verde. Our latest tree-ring date for Mug House is 1277, but this does not necessarily mark the end of all activity in the ruin. We may assume that Mug House was abandoned about the same time as the rest of Mesa Verde.

It is possible to observe some details in the abandonment story of Mug House. As the pueblo grew in size, several of the rooms ceased to be occupied, so that at no time was the entire village fully inhabited. Rooms 8, 56, and 29/1 were clearly filled with refuse when we dug in them, and there may have been others that had been dug out in previous years. Kivas B and G had obviously been cleaned out as people gave up their use. Kiva B had also been partly dismantled, burned, and mostly filled with trash. The missing roofs of several of the upper-ledge rooms could indicate they were abandoned and the timbers robbed for use elsewhere in the site, unless this condition resulted from recent digging, probably around the turn of this century. Certainly many of the rooms and kivas show signs of remodeling and realinement, possibly resulting from re-use of these spaces.

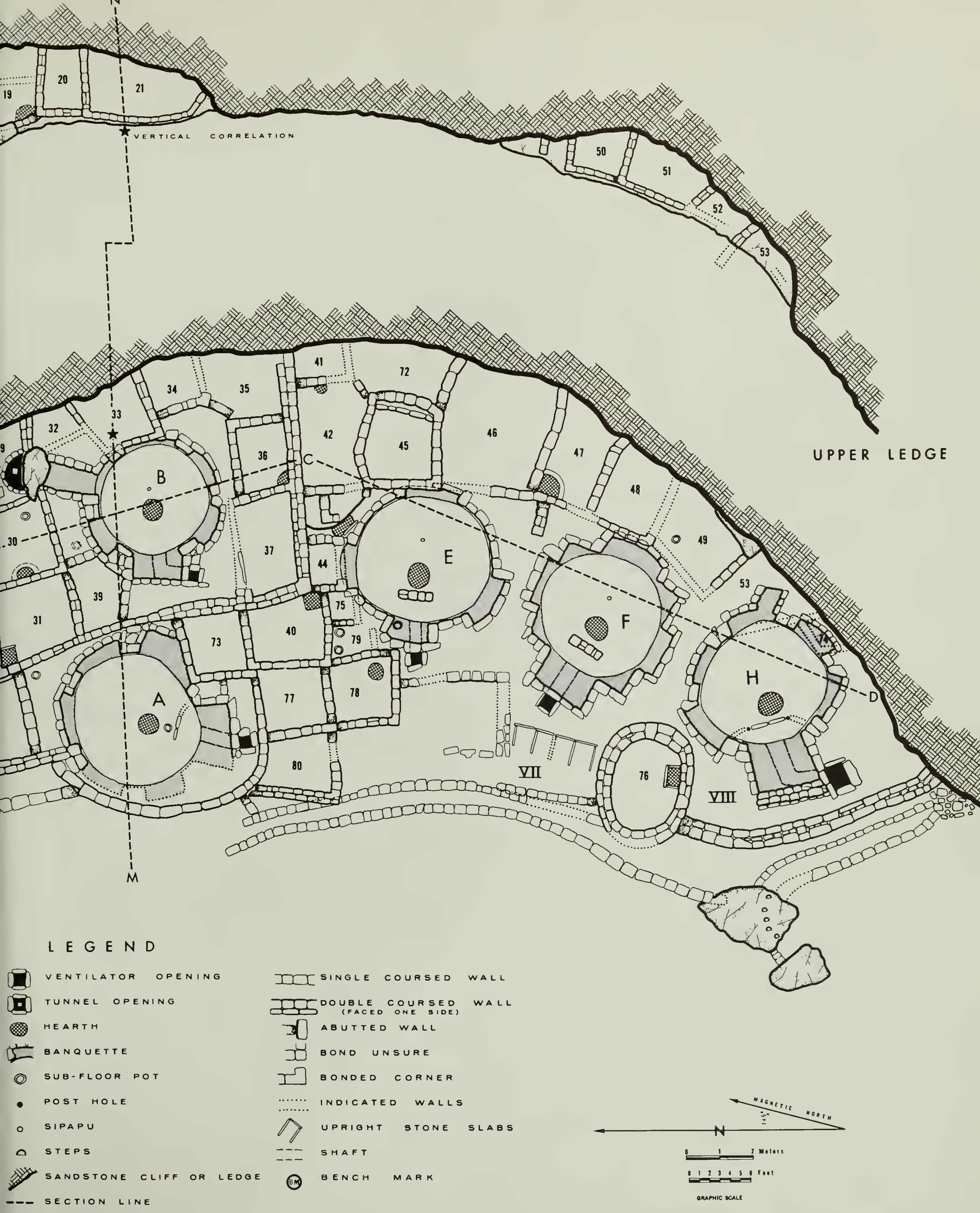
The last persons to depart from Mug House left much behind. We found tools and utensils in place on the floors and banquettes of at least 4 kivas, 14 rooms, and both towers. More may have been present in other spaces that had been cleaned out by previous diggers.

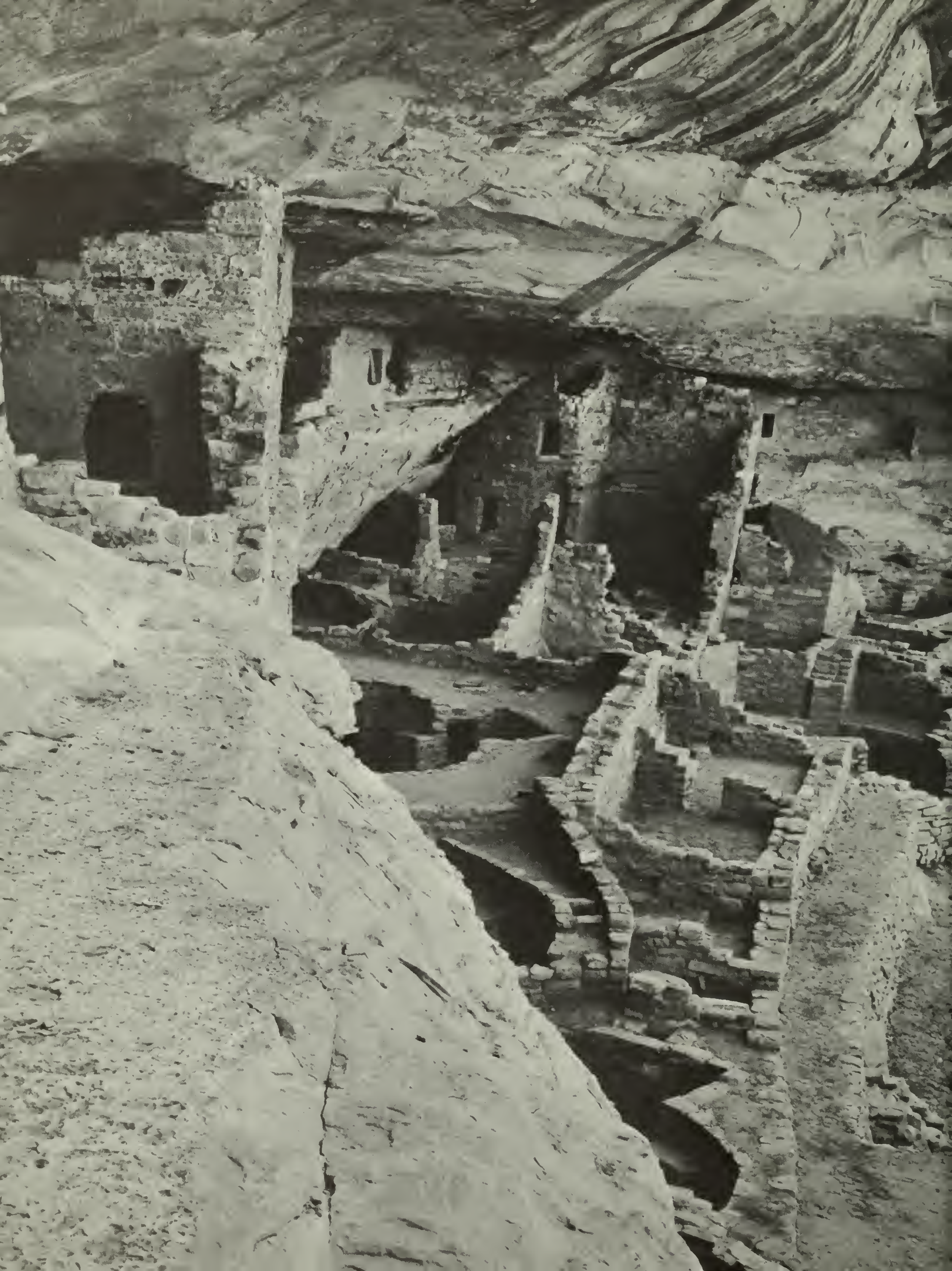
The numerous items in the rubble of fallen walls in some of the kivas indicate that some upper-story rooms which had collapsed before the arrival of the white man must have contained many other objects. This suggests a fairly large population until the final years. Most of the items appeared to have been left where they were last used. On the other hand, there were no signs of violence, such as smashed pottery or sprawled human skeletons. It would seem that the last Muguenos simply left, probably in a group, without bothering to clean house.

Headquarters of the Wetherill Mesa Project, 1959–65.


MUG HOUSE
SITE 1229
G
16
V
IV
15
14
III
13
57
12
56
6
55
11
8
5
10
VERTICAL CORRELATION
7
2
9
4
3
1
II
26
C
25
B
I
23
D
24
22
63
66
71
58
70
G
60
F
A
BM
BENCH MARK
VERTICAL CORRELATION
54

23 Lower cave and upper ledge of Mug House.


N
19
20
21
VERTICAL CORRELATION
50
51
52
53
UPPER LEDGE
41
72
34
35
33
32
42
45
46
47
36
48
C
B
49
30
37
44
E
F
53
39
31
75
40
73
79
H
D
A
77
78
80
VII
76
VIII
M
LEGEND
VENTILATOR OPENING
TUNNEL OPENING
HEARTH
BANQUETTE
SUB-FLOOR POT
POST HOLE
SIPAPU
STEPS
SANDSTONE CLIFF OR LEDGE
SECTION LINE
SINGLE COURSED WALL
DOUBLE COURSED WALL (FACED ONE SIDE)
ABUTTED WALL
BOND UNSURE
BONDED CORNER
INDICATED WALLS
UPRIGHT STONE SLABS
SHAFT
BM
BENCH MARK
MAGNETIC NORTH
N
0 1 2 Meters
0 1 2 3 4 5 6 Feet
GRAPHIC SCALE



CHAPTER 2

house and village arrangement

The name Mug House applies to a group of structures set together in one of the many rock shelters common to the cliffs of Mesa Verde. Although built at various times, these structures form a clearcut unit, for even the latest ones were built in conformity with already existing structures. I am not including here the earlier houses in Mug House cave that were demolished to make room for later buildings, but rather all the houses, storerooms, kivas, towers, and other spaces that served as units of excavation and that are shown on the map and in cross sections of the ruin (figs. 23 and 24). This is the ruin that has been preserved through stabilization for visitors to see.

In primitive societies, cooperative work groups and economic units affect the size and shape of dwellings and their relationships in a village layout. The archeologist can often identify space clusters probably occupied by some of these units, and he may even be able to estimate their size. It is unnecessary to know the exact makeup of all these units or by which line of descent their membership is determined to state their presence and approximate size. Ultimately, further inferences may be drawn from ethnographic survivals, from a more complete knowledge of the total prehistoric material culture, and from a better understanding of primitive societies in general.

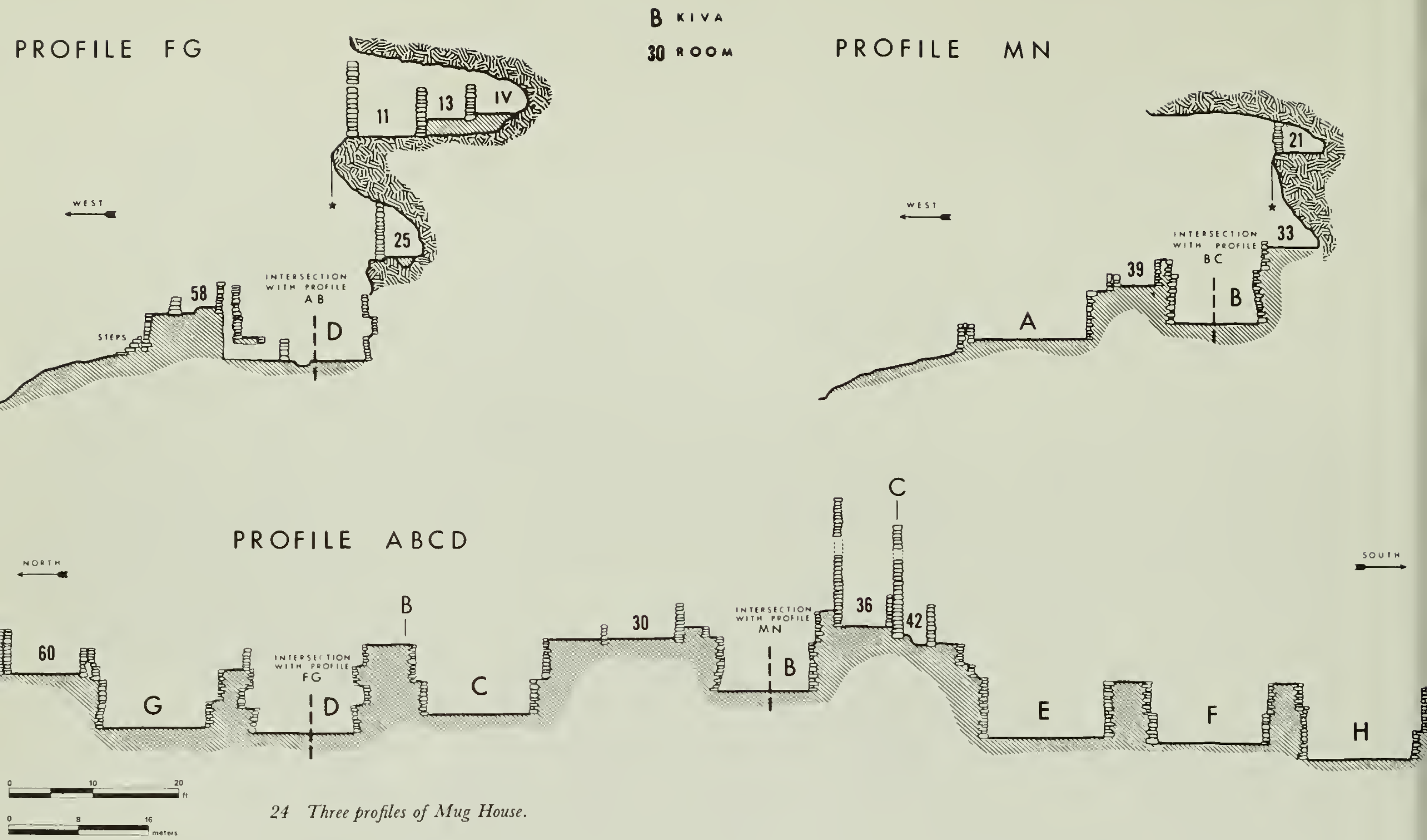
For Mug House, I will restrict interpretation to the probable presence of social groupings and offer some estimate of their size. Four levels of complexity are recognizable: (1) Clusters or *suites* of three to nine contiguous rooms with some adjacent outdoor space in an area or a courtyard quite probably represent household living quarters. (2) Several households, or one unusually large household cluster, may share a single courtyard space and are called *courtyard units.* (3) The total plan of the ruin further suggests a *dual division*, both in the layout of routes of access between the two parts and in the nature of construction seen in their kivas. (4) Finally, Mug House forms the nucleus of a larger *community*, which at one time at least included occupants of the two small caves lying immediately north of the large ruin.

SUITES (HOUSEHOLD UNITS)

Definition of a household is rarely undertaken by writers on social organization, who are more concerned with the makeup of family units and how they operate within the society. When the term household does appear, it frequently bears connotations of some group larger than a nuclear family (Murdock, 1960, p. 23). Without the benefit of living informants, it becomes advisable to think in terms of abstract groups whose exact membership is immaterial, but which leave positive traces behind in architecture and site layout. Thus any group of individuals who share the economic workload and occupy jointly one house or cluster of contiguous spaces that are well demarcated and into which outsiders do not freely intrude may be called a household. One person can constitute a household if he does not depend upon the regular cooperation of others in his everyday chores. Similarly, nuclear families, joint or composite families, several unrelated persons, or even entire small communities might conceivably make up households, although the vast majority of households in living societies equate roughly with some form of family (Murdock, 1960).

The primary criteria used in delimiting suites center around mutual accessibility of their component spaces and relative isolation of these same spaces from other room blocks. Throughout the ruin, doorways tend to connect clusters of rooms and outdoor areas around one large nuclear space. Wall abutments generally indicate separate building stages between suites as well as sequential construction within a single unit.

Not all rooms and spaces in Mug House can be satisfactorily assigned to one of the suites. Some are too poorly preserved to retain doorways or wall abutments; others fit equally well into more than one unit. Conse-

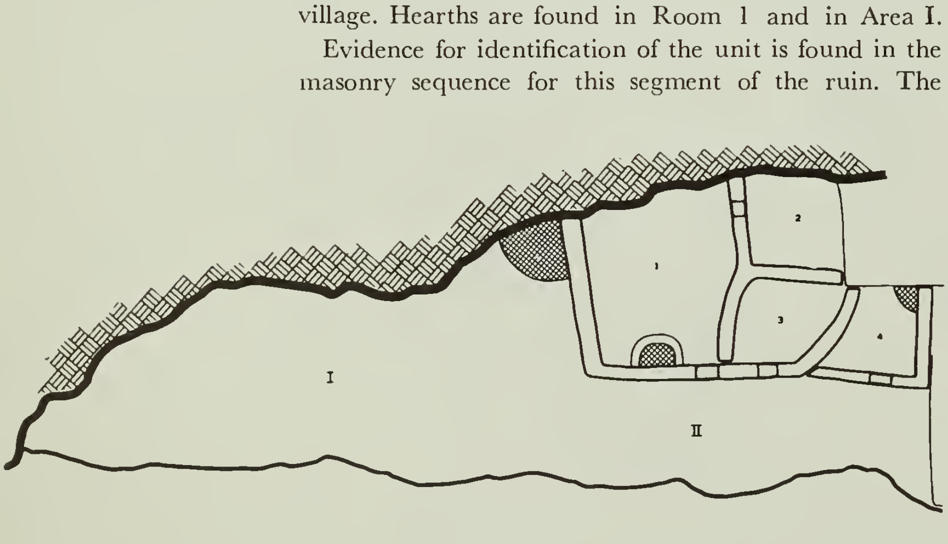

B KIVA
30 ROOM
PROFILE FG
WEST
11
13
IV
25
58
STEPS
INTERSECTION WITH PROFILE AB
D
PROFILE MN
WEST
21
33
INTERSECTION WITH PROFILE BC
39
B
A
PROFILE ABCD
NORTH
SOUTH
60
G
INTERSECTION WITH PROFILE FG
D
B
C
30
INTERSECTION WITH PROFILE MN
B
36
C
42
E
F
H
0
10
20
ft
0
8
16
meters

24 *Three profiles of Mug House.*

quently, the following discussion of suites will begin with those that are most easily defined—on the upper ledge—and will include alternative interpretations. Each suite is labeled by the number of the room that served as the hub of activity. (The number following the / represents the story level for that particular room.)

Suite 1 (fig. 25). Room 1 provides the main indoor living and work space and serves as the nucleus. An outdoor work space is found in Area I. Storage Room 2 opens out of Room 1, and Rooms 3 and 4—probably used for sleeping by children and for some storage—open onto Area II along with Room 1. Area II also provides the sole access, other than by ladder, to other parts of the village. Hearths are found in Room 1 and in Area I.

Evidence for identification of the unit is found in the masonry sequence for this segment of the ruin. The entire space of Rooms 1, 2, and 3 was first enclosed by a single wall, then later subdivided into the three separate rooms. Still later, Room 4 was added, but with its doorway oriented toward the common access of the other rooms. Three doorway lintel sticks and two wall pegs still intact in this room block are all of serviceberry.


2
1
3
4
I
II
0
5 ft

25 *Suite 1.*

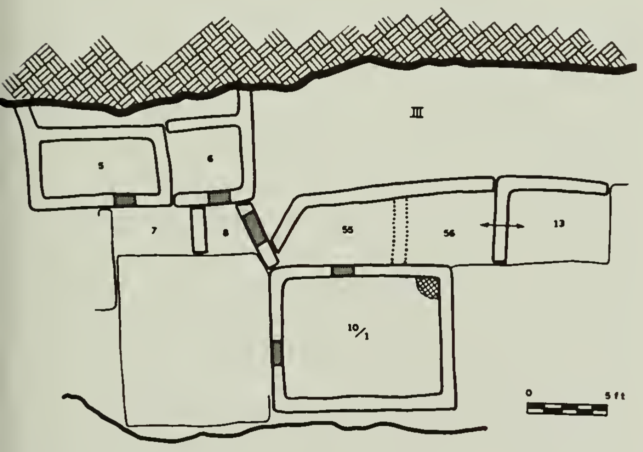
Suite 10/1 (fig. 26). Six, and possibly eight, rooms are assigned to this unusually large cluster, which had a complex building history. Room 10/1, the nucleus, began as one of the first four rooms in Mug House, and its occupants may have been related to and cooperated economically with the inhabitants of the other three. The most recent doorway patterns indicate subdivision of this original group into three units, each of which grew in separate directions. Rooms 5 and 6 were built next, probably for storage, although Room 5 could also have provided sleeping space. Next, a short wall containing a doorway spanned the interval between the near corners of Rooms 10/1 and 6, helping to enclose the space designated Areas III, IV, and V. With the construction of Room 9—probably a ceremonial structure related to the kivas (see ch. 4)—Room 7–8 was also formed. This last space soon became two small storage units by the placement of a short partition. Room 8, however, was soon dismantled, apparently to permit access between Areas II and III, and following this, Room 55 was added.

The only definite hearths exist in Room 10/1 (the main dwelling room) and in Room 7. The latter hearth apparently functioned in an outdoor work area before Rooms 7, 8, and 9 were built. Area III and the rooftop of Room 9 possibly had hearths at one time.

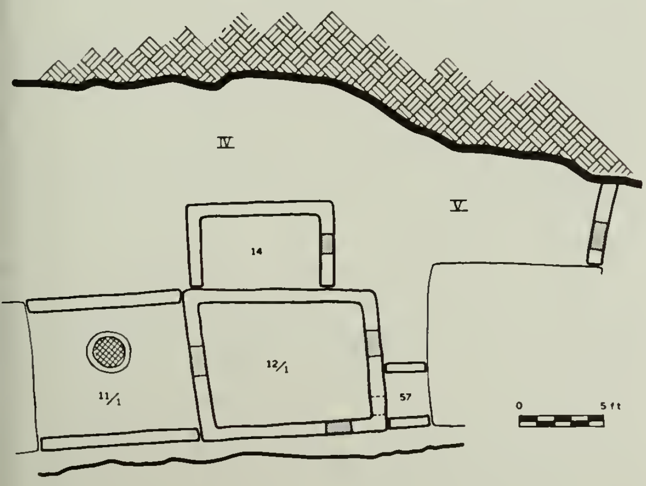
Rooms 56 and 13 probably belonged to this cluster as well. Room 13 must have opened into Room 56, although there are no signs of a doorway in the remaining parts of its walls. Since Rooms 55 and 56 seem to have been built simultaneously, even though later than Room 13, and since Household 10/1 used Area III, affiliation with this group is most likely. The only other possible relationship depends on the chance that a doorway once existed between Rooms 11/1 and 56, where the wall is now missing.

Assuming that all eight rooms did belong to this group, not all were in use at the same time. Room 8 became part of the passageway between Area III and the rooftop of Room 9. Room 7 virtually blocked use of Room 5, which could hardly be entered if the former contained many items. The extreme destruction of the walls of Rooms 55 and 56 did not come about through natural causes but seems likely to have resulted from human activity, as this entire part of the ruin is well sheltered by the overhanging cliff. It seems probable that the many fluctuations in size and arrangement reflected changing architectural requirements of the socio-economic group that inhabited this space.

In-place wooden parts of structures reveal a greater diversity than in the preceding suite. Serviceberry was used for wall pegs in 5 cases; a sixth peg was made of willow. Three doorway lintel sticks were made of mock-orange, saltbush, and juniper. Remnants of roofing found in Room 10/1 were identified as juniper and mountain-mahogany.



26 *Suite 10/1.*



27 *Suite 12/1.*

Unfortunately, this room block has been thoroughly disturbed, not only by previous excavators, but also by rodent activity and the hands of the prehistoric human occupants. A corrugated jar was discovered beneath the wall of Room 55 where it had seemingly been forgotten by the later builders. Human feces filled a corner in Rooms 55–56, undoubtedly deposited there after these spaces passed beyond their original intended use. Wood rat nesting materials filled approximately one-third of Room 5. Consequently, few of the artifacts recovered here can be safely associated with the human occupation.

Suite 12/1 (fig. 27). Two dwelling rooms, two storerooms, and most of the enclosed space at the back of the cave make up this group. Rooms 12/1 and 11/1 once formed the central part of the first unit in Mug House; they provided both the nucleus and living quarters for this cluster. Rooms 14 and 57 were added to increase storage space. The deep deposits in Area V indicate a long period of use with little change.

Hearths occur in Room 11/1 and in Area V. A corrugated storage jar containing squash seeds was found beneath one of the walking surfaces in Area V. Once again, concentrations of human feces filled corners at the back of the cave.

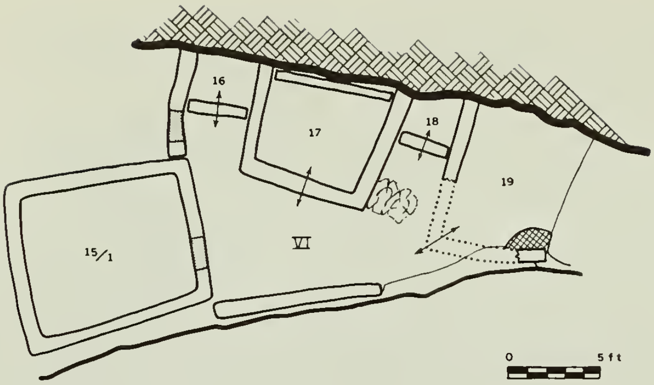
Twenty-five wooden architectural items, identified in place again, reveal a wide range of choice (table 9). Serviceberry and oak predominate for all uses except roofing and were used side by side. Six remaining wall pegs in Room 14 are equally divided among serviceberry, mountain-mahogany, and oak.

TABLE 9.—WOODEN ARCHITECTURAL ITEMS IN SUITE 12/1

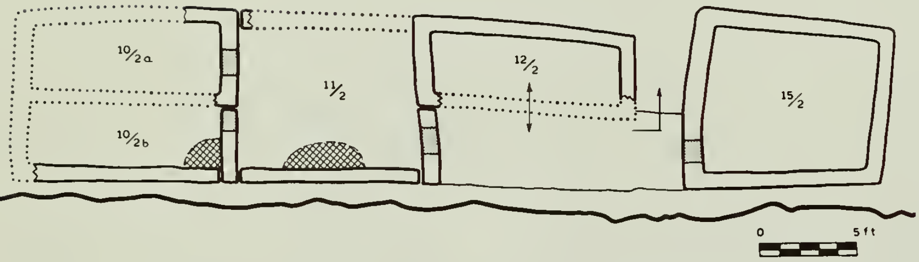
	Wall pegs	Doorway lintel sticks	Ventilator crossed sticks	Wall loops	Roofing	Totals
Serviceberry	5	1	2			8
Oak	4	2		1		7
Mountain-mahogany	2					2
Willow	2					2
Juniper		1			4	5
Pinyon					1	1

The pattern of traffic flow, reflected in doorway placement shown in figure 27, clearly unifies this room block. It also sets the boundaries. As noted above, Rooms 13 and 56 may have belonged to this group, but it is much more likely that they were attached to Suite 10/1.

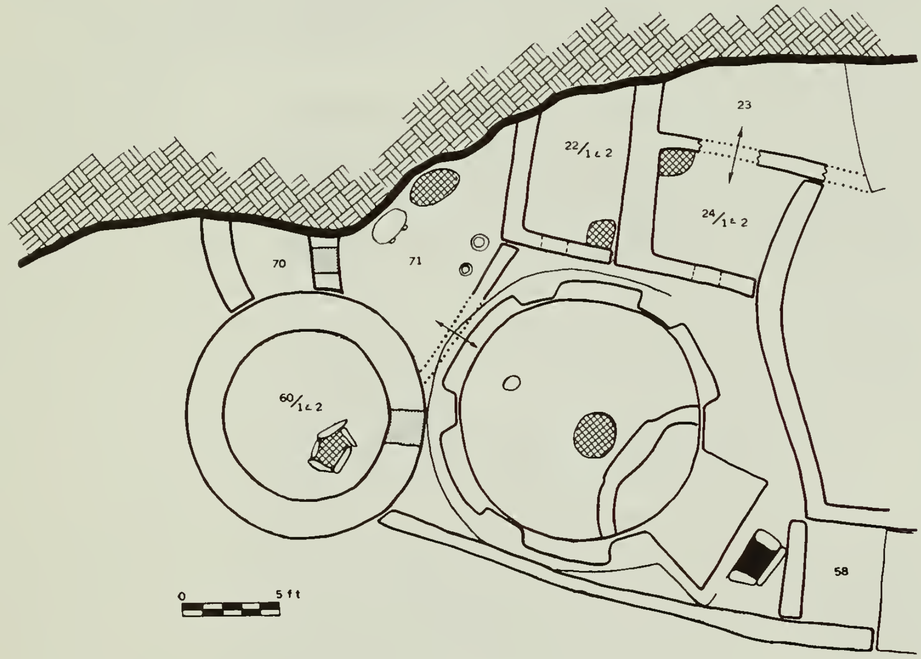
Suite 19 (fig. 28). Like the two preceding units, this group grew from a single room that formed part of an earlier cluster. In its last use period, Room 19, which had a hearth, formed the nucleus and was the primary living room of this suite. Room 15/1 is large enough for living and sleeping, but it contained no hearth. Rooms 16, 17, and 18 provided storage space. The finished



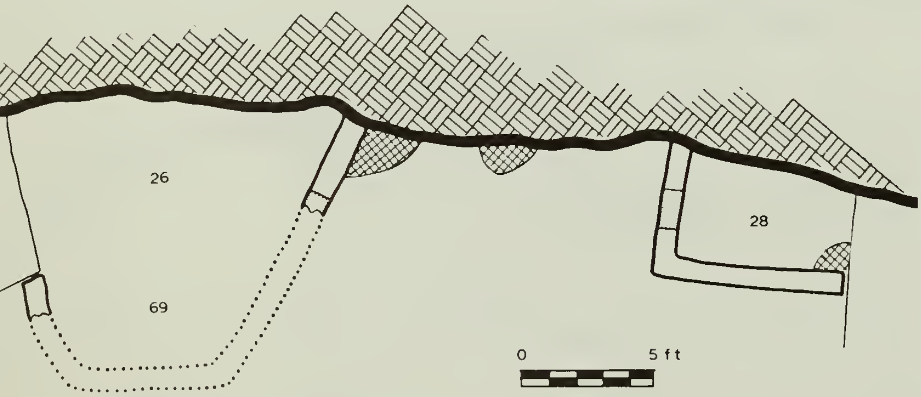
28 *Suite 19.*



29 *Suite 11/2.*



30 *Suite 71.*



31 *Suite 26.*

appearance of the interior of Room 17 suggests that it may have served also as a living room.

All five of these rooms cluster about Area VI, which must have acted as the central work space and which provided access to other parts of the village. A corrugated storage jar and the remnants of two grinding bins were uncovered in stratified trash deposits filling this space. Late Pueblo II pottery in the lowest level, giving way to late Pueblo III ceramics in the upper levels, suggests that this room block developed early and was used during most of the history of Mug House.

All 18 in-place wooden architectural items identified for this suite are in Room 15/1. Serviceberry was used for five wall pegs and one doorway lintel stick. Juniper appears in two wall pegs, the poles forming a doorway lintel, and three of six main roof timbers. The other three timbers are Douglas-fir. Two oak loops bound together two of the timbers at the south wall. Five skunkbush hand loops, on the exterior west wall of Room 15/1, form part of a series of loops, set also in walls of Rooms 10/1, 11/1, and 12/1, to facilitate passage along the lip of the upper ledge. Those loops in the other rooms, belonging to other suites, are oak.

Suite 11/2 (fig. 29). This upper story group consists of five rooms and a small balconylike outdoor space formed by the roof over half of Room 12/1 and Room 57. The nuclear space is Room 11/2, with a large hearth against the center of the west wall. The well-plastered interior of Room 12/2 suggests that it functioned as a living and sleeping unit, even without a hearth. The other three, Rooms 10/2a, 10/2b, and 15/2, had much headroom, and were probably used for storage and possibly sleeping. Room 10/2b contained evidence of a hearth.

The doorway pattern of this group clearly indicates the interaction of all these spaces in the lives of an intimately associated group of individuals, and sets sharp boundaries between this unit and the surrounding dwellings. Such a well-defined unit can certainly be referred to as a "house," "apartment," or "dwelling unit" with much more confidence and significance than an individual room or kiva.

None of the 12 wooden architectural items still in place were made of serviceberry. Two wall pegs are mountain-mahogany and oak; two doorway lintel sticks are juniper and oak. There are five oak loops around two of the doorways, and three juniper poles form the lintel over one of them. These two doorways are the only ones in the ruin that might have been closed by hangings, such as mats, rather than by stone door slabs.

Since the floors of these upper story spaces had collapsed, it is impossible to associate any ceramics or other artifacts with this suite.

Suite 71 (fig. 30). This suite, the largest, seems to coincide with a courtyard unit. Its focal point appears to be the irregularly shaped Room 71, where a hearth, stone table, two storage jars, and a host of other tools and utensils suggest food preparation activities in a space too crowded to permit sleeping and ordinary living. Storage Room 70 opens out of the back wall. Two stories each of Rooms 22 and 24 provided living and sleeping space, with at least three spaces having once contained hearths. A second storage space, Room 23, was reached through Room 24/1; Room 58 would have been a third if it belonged to this group. Both stories of Room 60 (the north tower) seem to have been associated with Kiva G, but lacked evidence of full-time domestic use.

Undoubtedly all the space in Courtyard G was available as a work and living area, although all traces of specific features are now gone. It is very probable, however, that all of the artifacts recovered from the fill of Kiva G belonged to this household and courtyard unit. No wooden architectural items were found in place.

The members of this household must have belonged to more than one nuclear family, yet they seem to have organized their dwelling along somewhat specialized lines. It is impossible to state whether an extended family or some other kinship group is represented here, or whether several unrelated couples and/or individuals chose to share their domestic lives. However this room block may be interpreted, its unusual size and organization set it apart from all other comparable units in Mug House.

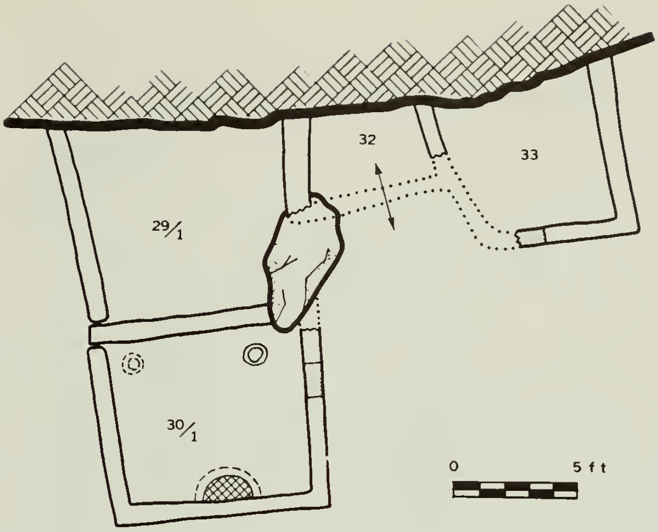
Suite 26 (fig. 31). Three rooms (Rooms 26, 69, and 28) and an intervening part of Courtyard C make up this small unit. There are two hearths in the courtyard, but none inside the rooms. In contrast to the preceding cluster, it is hard to imagine more than a single nuclear family inhabiting this suite. Only Room 26 is large enough to accommodate adults comfortably.

All the spaces in this unit had been thoroughly cleaned out prior to our work in 1960. One doorway lintel stick remaining in Room 28 was made of serviceberry.

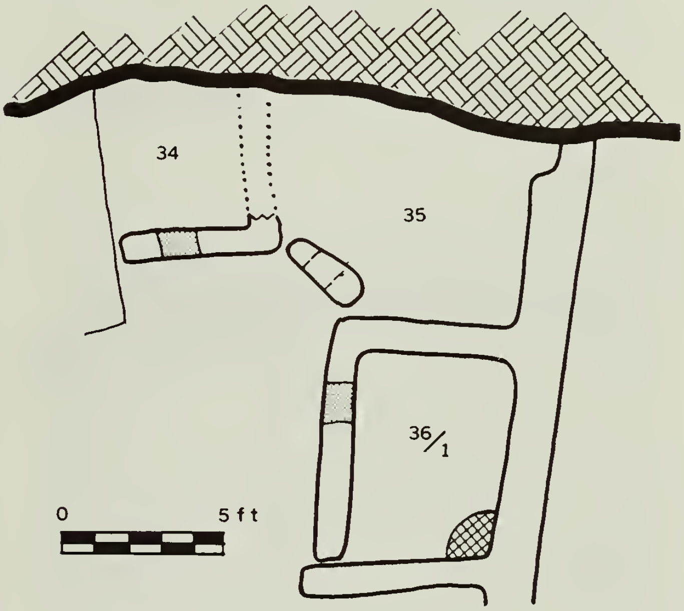
Suite 30/1 (fig. 32). A single large dwelling (Room 30/1) containing a hearth is augmented by work Room 29/1, with six grinding bins, and storage Rooms 32 and 33. A small corner of Courtyard B was also available for work. The abandonment of Room 29/1 may indicate a decrease in the number of persons in this unit. Perhaps the six grinding bins in Room 29/1 were originally designed to serve a unit larger than one household.

Suite 36/1 (fig. 33). Two small storehouses (Rooms 34 and 35) apparently belonged to the occupants of Room 36/1. Once again, only a small nuclear family could fit into the available floor space. Outdoor work space was provided by another corner of Courtyard B. The only wooden items found in place were three juniper poles forming the lintel of a doorway and part of a juniper shake used in roofing. Room 36/1 contains the only hearth.

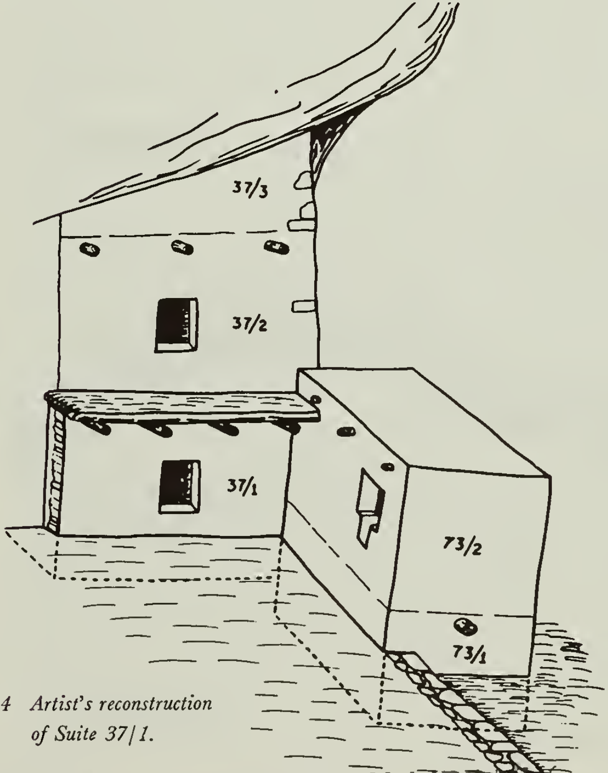
Suite 37/1 (fig. 34). Most household units occupy one level, or at least cover more horizontal than vertical space, but this suite seems to be an exception. The three stories of Room 37 were built either all at once or very nearly so. A balcony provided access to Room 37/2, while the low topmost storeroom was most likely entered through the roof of the room below. When more space was apparently needed at a later date, two more rooms were was added, one on top of the other, at the northwest corner of the original building. The lower one (Room 73/1) for storage, but the upper may have served as a living room. It was built on the same level as Room 37/1, and its doorway



32 Suite 30/1.



33 Suite 36/1.



34 Artist's reconstruction of Suite 37/1.

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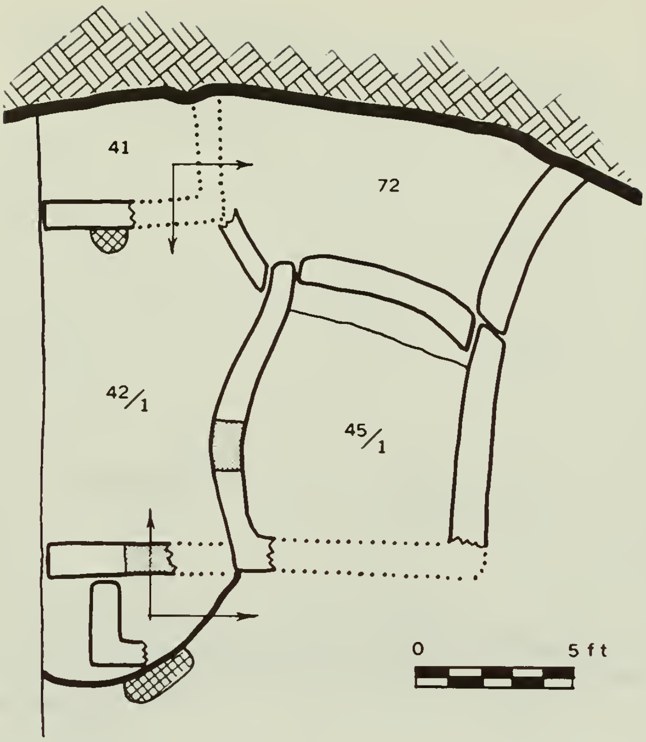
opened onto the same corner of Courtyard B. There is evidence of a small hearth in one corner of Room 37/2, but there has been too much disturbance to leave definite traces of others.

Materials for 10 in-place wall pegs include 6 serviceberry, 2 juniper, 1 oak, and 1 mountain-mahogany. One balcony support of juniper is still intact.

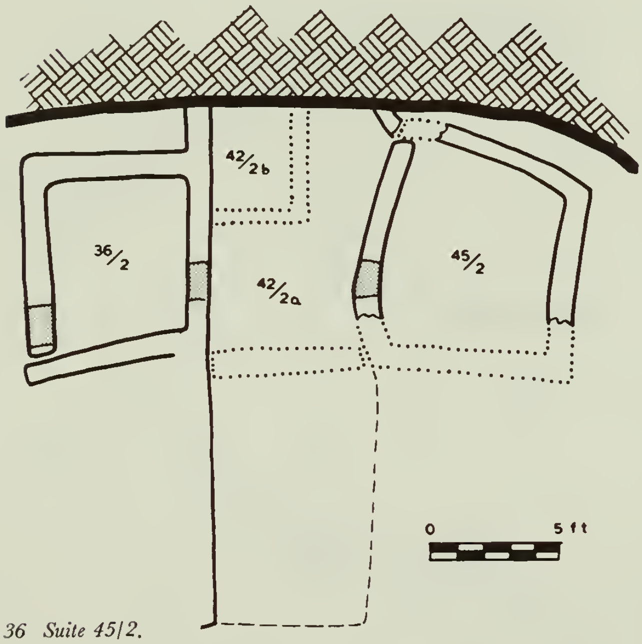


35 *Suite 42/1.*

Suite 42/1 (fig. 35). Two interconnecting living rooms (42/1 and 45/1), augmented by the storage Rooms 41 and 72, which were entered from the rear of Room 42/1, open onto a corner of Courtyard E. Because of the construction of some adjacent rooms, communication between Room 42/1 and the courtyard was restricted to a small passage. Hearths are found in the corner of the courtyard and in the central living room.

Room 45/1 was first built apart from all other then-existing buildings, but close to the back of the cave and to the Courtyard B structures. The other rooms were then formed by simply enclosing the in-between spaces, with one of them assuming the nuclear role.

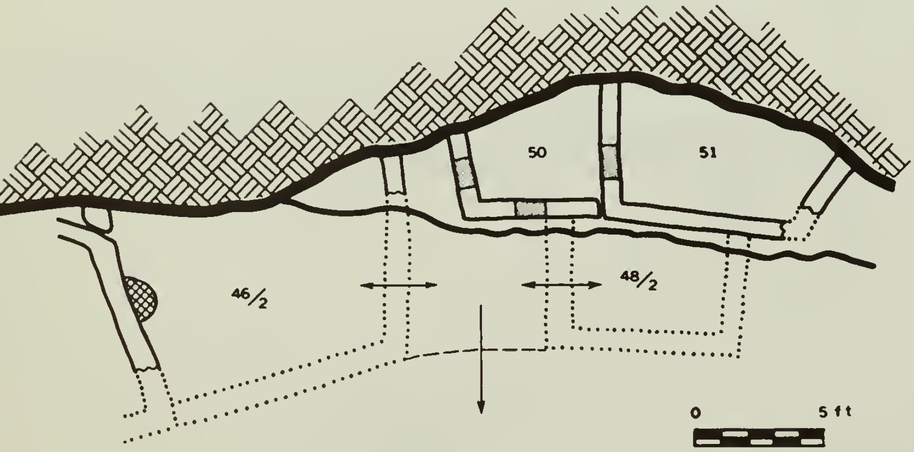
Three of the four original main roof beams remain in place and have been identified as pinyon, Douglas-fir, and juniper. Serviceberry and greasewood were used in two wall pegs, and two broken digging sticks—one of oak and one serviceberry—served as doorway lintel sticks.



36 *Suite 45/2.*

Suite 45/2 (fig. 36). The primary unit of Rooms 45/2 and 42/2a for living and of Room 42/2b for storage was enlarged by cutting a doorway through an existing wall to annex Room 36/2. This space may originally have been built as a part of Household 36/1, but was no longer needed by that group when annexed. It is also possible that the founding family of Household 45/2 originated as part of Household 36/1. The outdoor work space for this unit was provided by the rooftop of Room 44/2.

Three wall loops in Room 45/2, probably used to anchor a belt loom, were made of oak. In Room 42/2a are a serviceberry wall peg and a pinyon suspension pole.



37 *Suite 46/2.*

Suite 46/2 (fig. 37). A second-story unit, this suite has many of its walls entirely missing. Rooms 50 and 51, two storage rooms built on a narrow upper ledge, are in excellent condition, but the probable living Room 48/2 is known only from mud lines on the cave roof, and only remnants of Room 46/2 are still visible. Quite likely all of the spaces were accessible from the rooftop of Room 47, which served as an outdoor work area. There is evidence of at least one hearth, in Room 46/2. Lintel sticks in the doorways of Room 50 were made from mountain-mahogany and juniper.

Besides the 13 households that can be reasonably well delineated, it is possible that other contiguous groups of rooms may be considered in the same category even though the evidence for them is quite sketchy. The following four clusters may be tentatively recognized:

Suite 29/2: Rooms 29/2, 30/2, 20, 21.
Suite 31: Rooms 31, 39, Courtyard A.
Suite 63: Rooms 63, 62, 66, and probably Courtyard A.
Suite 77: Rooms 77, 78, 80, and the outermost portion of Courtyard E.

An alternative grouping might combine Rooms 31, 39, 62, and 63 into one unit, with Room 66 a detached space belonging to another. The remaining rooms are too poorly preserved to permit even tentative grouping into suites.

We might estimate that about 20 nearly contemporaneous household groups could have occupied Mug House. The average group inhabited from four to five rooms, including both living and storage quarters, with some adjacent outdoor space for work and possibly leisure activities. All spaces within a suite were easily accessible to one another, but movement between suites was generally restricted to one or two routes. One room, larger than the others and usually containing a hearth, seems to have served as a nuclear living room. Nearby smaller rooms provided storage and additional sleeping space. Wherever the outside space is well enough preserved, at least one hearth may be found, so it may be presumed that each household also used outdoor hearths.

Among the living Pueblo Indians in New Mexico and Arizona, the fundamental local unit is the household (Kroeber, 1917; Parsons, 1939, p. 5; Eggan, 1950; White, 1962, p. 198). A Pueblo household may consist of a nuclear family, an extended family, or individuals related only distantly, if at all. Thus, while the makeup of this unit may vary, even from day to day, there is a consistent pattern of cooperation in all aspects of daily life that is reflected in the positioning of houses.

From the foregoing we can characterize the average Mug House household as a group of related individuals who shared in the tasks of getting and preparing food and making and using the necessary household utensils and tools, and who shared the same living and sleeping spaces. We are not justified in projecting specific kinship groupings into these ancient household remains, but the range in size does suggest that the smallest housed only a couple and their offspring, and that others most likely contained larger social units. There is no positive evidence of individual persons living alone, unless it be in Room 66, which could easily have held two people even if it did stand unaffiliated with other rooms. White (1962, p. 198) states that no one in Zia Pueblo lives alone and points out that even unrelated persons will congregate into households rather than remain by themselves. It would appear safe to say that the basic role of the household in Pueblo society was already well established among the inhabitants of Mug House during the 1200's, and that this social unit has changed little if at all over the past 700 years.

COURTYARD UNITS

Prior to their occupation of the larger cliff houses, most aboriginal Mesa Verdeans lived in mesa-top houses consisting of about 8 to 15 contiguous rooms grouped near or partly around one kiva. Examples of this kind of house may be seen at One Clan House (Fewkes, 1923, pp. 102–105), Site 16 (Lancaster and Pinkley, 1954), Sun Point Pueblo (Lancaster and Van Cleave, 1954), and Two Raven House. None of these fit very well the description of a "unit type" pueblo proposed by Prudden (1903, pp. 234–239), but they embody his primary concept that a block of secular rooms with associated kiva and refuse heap form a unit of habitation.

Somewhat similar units arranged side by side seem to make up Spruce Tree House, according to Fewkes (1909, p. 8). One of these units contains at least two kivas, and a third may have been associated with it, in much the same manner as some of the more complex mesa-top ruins, e.g., Big Juniper House (Swannack, 1969). Comparable units also may be seen in Mug House, particularly if we keep in mind the construction history of this ruin. The term "courtyard units" is tentatively applied to them because the roofs over kivas formed level, open courts around which houses seemed to cluster.

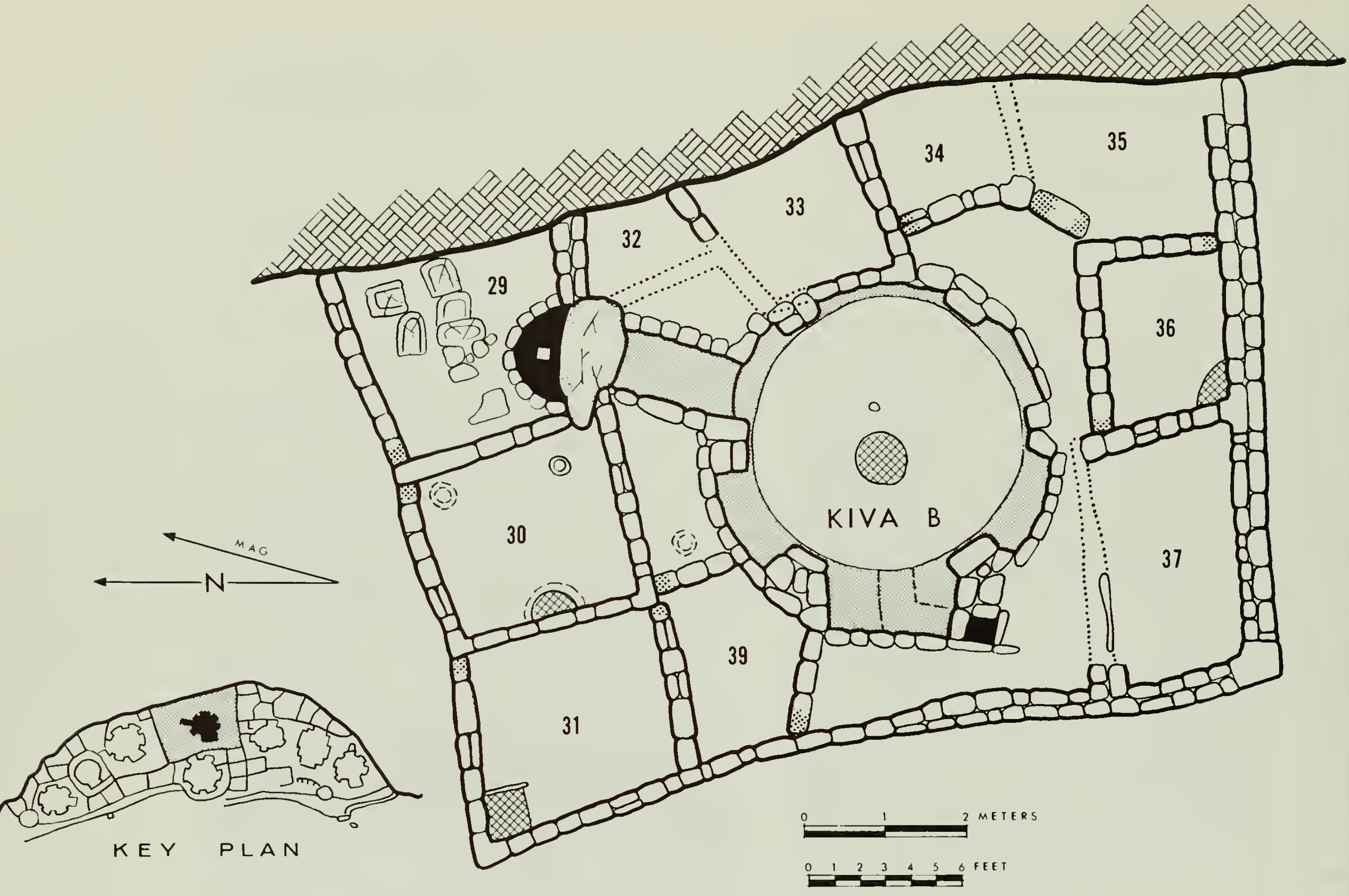
As we have already seen in the preceding section, the first two segments of Mug House proper to be constructed closely resemble in layout and appearance the habitation units of the mesa top. As Mug House grew, not only were more units added, but these two became more complex. By the time the village reached its maximum size, the makeup of the units became somewhat blurred, so that the following delineations of courtyard units are subject to some variable interpretation.

Courtyard Unit G (fig. 30). The unusually large Suite 71 plus Kiva G and the two stories of Room 60, the north tower, make up this group. It seems possible that these last two nondomestic structures may have been used intermittently for secular pursuits by the household's members. All of the spaces in this unit, except Kiva G, had items resting on their floors at time of abandonment. This is the most clearly defined of all courtyard units in Mug House, probably because of the coincidence with a household unit.

Courtyard Unit B. When this unit was first built, it apparently consisted of nine one-story rooms arranged in a U around Kiva B (fig. 38). Subsequent growth added 10, possibly 13, more rooms, mostly on the second story, and Kiva A. One of these newer rooms was later realined with another unit. The final composition of this unit included Suites 30/1, 36/1, and 37/1, probably Suites 29/2, 31, and 63, and Kivas B and A. Kiva A was added without accompanying rooms, either to augment the restricted space in Kiva B or, more likely, to replace it.

Kiva B had been clearly abandoned during the main occupation of Mug House, and many of its features (deflector, sipapu, parts of banquette, recess, and liner wall) were removed or damaged. The structure then stood vacant for an unknown period, accumulating a thin layer of dust and sand on its floor, before its combustible parts were destroyed by fire. Unfortunately, it is now impossible to say whether or not the depression was then leveled off by the Muguenos, since unrecorded excavations in Mug House between 1890 and 1928 included extensive work in this kiva.

Rooms 62, 63, and 66 are included with this unit rather then with the succeeding one because of inferred access routes. While none of these rooms are very well preserved, all but the west walls still stand high enough to reveal doorways if any were present. Thus, these spaces had to be entered either from the west or through their roofs. The former route leads easily along the uppermost terrace of the north mound to the court



38 Early Courtyard Unit B.

formed by the roof of Kiva A; the latter route, somewhat less likely, would require ladders from the roofs to reach either Courtyards A or C.

Courtyard Unit C–D. This group of houses is the most difficult to interpret. Like the preceding unit, it began simply with five 1-story rooms and Kiva D (fig. 39), but steadily grew until 30 rooms, 2 kivas, and 1 kihu (Room 9)—a rectangular room serving also as a ceremonial chamber—were involved. In its final form, there seem to be three subdivisions centered around the three religious structures: Suites 1 and 10/1 focused on Room 9 and Suites 26 and 19 on Kiva C; and Suites 12/1 and 11/2 and Room 25 retained affiliation with Kiva D. It is very possible that each of these subdivisions became a distinct courtyard unit when its members left Mug House for some other location. On the basis of the remains available in this one ruin, however, it seems best to treat them as a single courtyard unit that simply grew in size and complexity from one habitation unit.

A dominant position was apparently held by this group of Muguenos, in comparison to all other inhabitants of Mug House. Their ancestors represent the first builders of Mug House, following the Component A occupation. Up until the time of total abandonment, they outnumbered all other similar units (on the basis of the number of rooms), they possessed the largest and most elaborate kiva (Kiva C), and they occupied the central position both in the cave and in the larger dual division.

Courtyard Unit E–F. The roofs of three kivas (E, F, and H) form one continuous level court, bounded on two sides by blocks of houses. Three suites (42/1, 45/2, and 46/2) and four blocks of poorly preserved rooms that may have been suites are included: (1) Rooms 40/1, 40/2, 44/1, 44/2, 75, and 79; (2) Rooms 77, 78, and 80; (3) Rooms 47, 48/1, and 49; and (4) Rooms 53/1, 53/2, 52, 74/1, and 74/2. Kiva E was built first, possibly followed shortly by Kiva F. Both seem to form nuclei for subsidiary clustering as in the foregoing unit. Kiva H was built last and without accompanying rooms, probably to supplement the other two rather than to replace one of them. The south tower—Room 76—is situated between Kivas F and H and may be affiliated with either one of them.

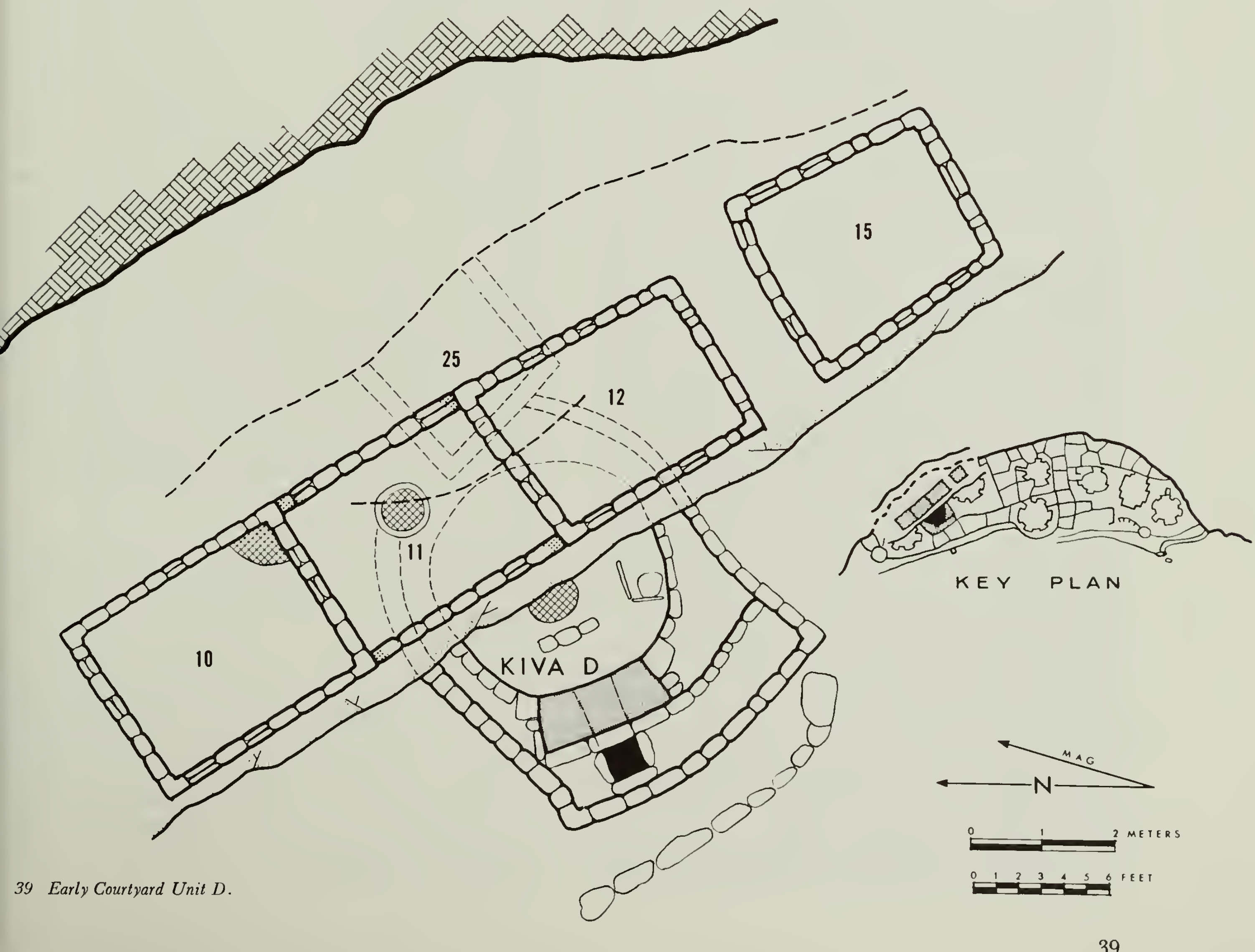
It is worth noting that no social or local unit exists among the modern Pueblos comparable to the courtyard unit or to the earlier habitation unit of Pueblo II. Fewkes (1909, p. 8; 1923, p. 102) suggested that these units housed members of one clan, but ethnographers emphasize that Pueblo Indian houses are not now distributed according to clans, and probably never were, but rather by actual kin affiliations (Parsons, 1939, p. 6, and 1940, p. 219; Titiev, 1944, p. 54). Thus, since courtyard and habitation units did not represent clans, we are left with these alternatives: (a) either the courtyard unit and earlier habitation unit are purely fictitious and do not represent any local grouping, or (b) the local grouping represented by these architectural units has passed out of existence or has been changed into a purely social grouping such as the lineage or clan. The consistency of these units, beginning in Pueblo I (Bullard, 1962, p. 175) and continuing through early Pueblo III, favors the second possibility, with the added implication that the growth in complexity and blurring of boundaries between courtyard units in Mug House reflect the general transition from the preceding pattern to that known among the modern Pueblos.

Throughout this discussion of courtyard units, kivas have been specifically associated with the various units as if they had been built and used by the persons occupying these units. This may be reasonably accurate for the two earlier components, but again Pueblo ethnography reveals a different pattern (Eggan, 1950). Kivas are built and maintained generally by the members of one clan, usually the one responsible for the ceremonies to be held there. Participation in the ceremonies, however, is not by clan. The relatively later construction of Kivas C, A, and H with few or no associated rooms indicates their builders were not or could not be particular about the spatial proximity of a kiva and the homes of its users. Is it possible that we can see here, in the amalgamation of households and larger units into the pueblo of Mug House, the beginnings of the historic Pueblo pattern of kiva ownership and use? I do not mean to imply that this pattern originated at Mug House, but that the features observed here reflect the widespread development of the pattern throughout the areas occupied by prehistoric Pueblo Indians.

The four courtyard units described above represent the latest occupation. It has been possible to trace growth and other changes in these units and in several cases to identify the earliest units built. In every case the earlier units, belonging to the two earlier components, differ in size and complexity from the latest four. Apparently only one unit existed in Mug House cave during the early component (A). During the middle component (B) there were four units—two in Mug House cave, one in Adobe Cave, and one in Site 1227—closely resembling the older habitation units of the mesa top. These four units then merged into one pueblo during the late component (C).

DUAL DIVISION

Rivalry and competition within a community are often organized and regulated by a division of community members into two groups. The most elaborate divisions, called moieties, determine their membership through



39 Early Courtyard Unit D.

kinship and limit the choice of marriage partners for their members. Not all dual organizations are so prominent in their social structures, however. Sometimes dual division simply allots ceremonial activities between two groups of persons (Lowie, 1948, pp. 240–242; Eggan, 1950, p. 302; Murdock, 1960, p. 47).

Duality is found among all the historic Pueblo Indians, varying in complexity from marriage-regulating moieties among the Northern Tiwa to the Hopi division of ceremonial responsibilities between two groups (Parsons, 1939; Eggan, 1950). This duality is reflected in house arrangement in several of the Rio Grande villages and in the two-kiva system of the Tewa and eastern Keres.

A number of features in Mug House point to a separation of the community into two parts. The ground-floor plan (fig. 23) reveals an east-west row of six rooms extending between Kivas B and E from the backwall of the cave to the outermost edge of the pueblo. Three of these rooms open to the north, and the other three open to the south. With one exception, there was no passage through any of them in a north-south direction. When Courtyard Unit B was first built, the south walls of Rooms 35, 36, and 37 formed a solid barrier. Later, as Rooms 40 and 77 were added, their north walls joined the west wall of Room 37 to extend this line. Still later, the occupants of Suite 45/2 cut an opening through the barrier in order to annex Room 36/2, which presumably was vacant at that time. For all practical purposes, the only route leading between the two parts of Mug House lay around the west side of Room 80, along the outermost terrace.

The kivas provide a second source of evidence for dual division. The five kivas in the north segment (A, B, C, D, and G) are remarkably alike when compared to those in other cliff villages, such as Spruce Tree House (Fewkes, 1909), Cliff Palace (Fewkes, 1911b), and Long House. They are round, with an encircling banquette, six roof-supporting pilasters, recess, and the standard triad of ventilator, deflector, and hearth. Although diameters range from about 11 to 12½ feet (three are 12½ feet in diameter), the placement and dimensions of the pilasters are remarkably alike. The distance across the recess and the interpilaster space directly opposite exceeds the other spacings by a constant amount in each kiva. The width of any one of the 25 measurable pilasters may vary as much as 0.2 foot from top to bottom, yet measurements for all 25 pilasters fall between 1.7 and 1.9 feet.

In contrast to these five, Kivas E, F, and H in the southern segment differ sharply from one another. Kiva H resembles the northern group, even in dimensions and pilaster spacings, but the other two are distinct, each in its own way. Kiva E had no pilasters, but essentially four small, shallow recesses. Its roof was carried directly on the walls Kiva F was originally built square with a small recess in the center of each side, and when the lower half was remodeled to a circular form, the upper half retained the square form. Other features in both are typical of all Mug House kivas. Each segment contained a round tower, probably associated with kivas.

According to the evidence of wall abutments, construction did not begin in the southern segment until its northern counterpart had already achieved a considerable size. At the peak of the occupation, it only equalled about half the size of the other and was probably subject to a certain degree of domination by the larger group.

Dual division is only discernible in the 13th-century occupation at Mug House, although there is the definite possibility that it existed earlier. One might divide the 12th-century occupation in two, with one group in Mug House and the other consisting of the two habitation units in Adobe Cave and Site 1227. Subsequently, the inhabitants of these two subsidiary caves may have moved into either Courtyard Unit G or the southern segment, with the latter more likely.

THE COMMUNITY

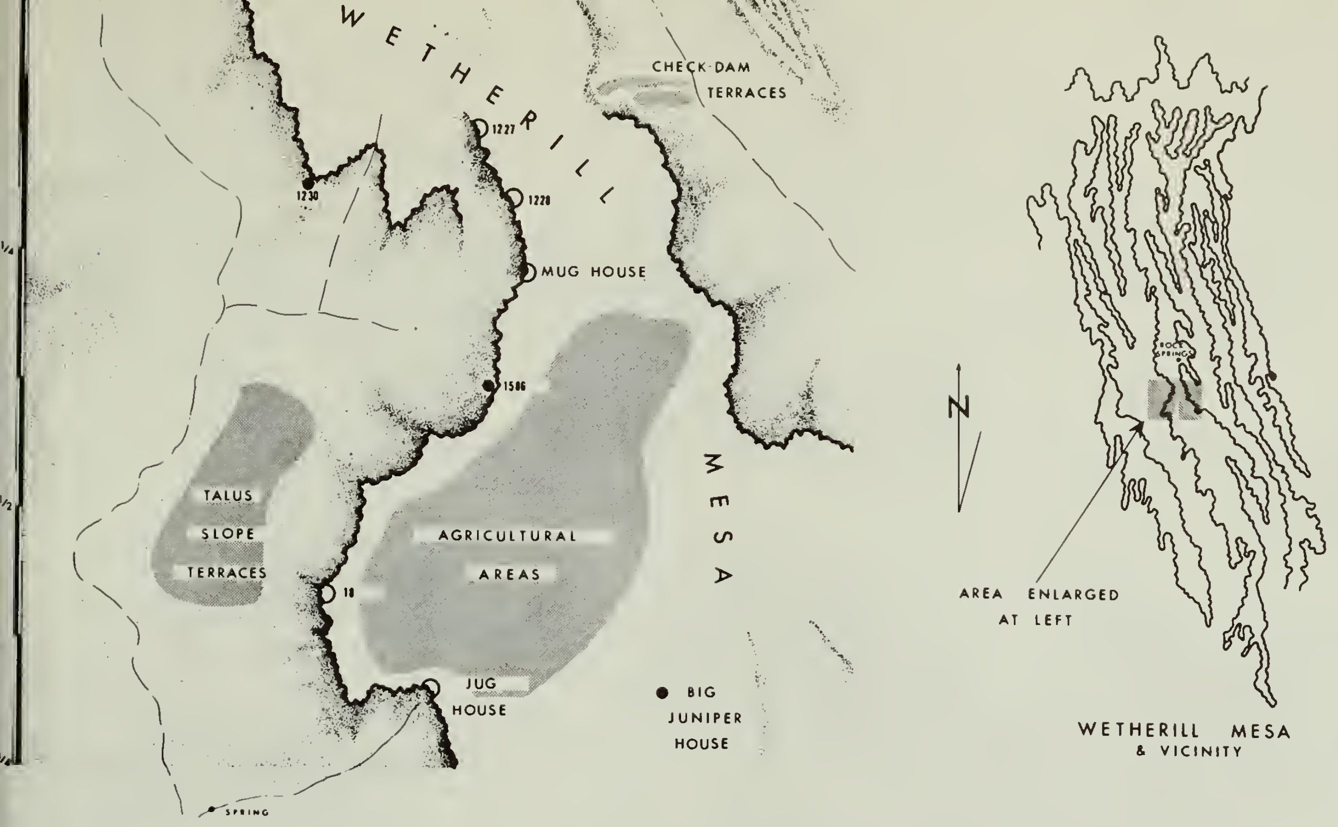
A community consists of persons who because of the proximity of their dwellings or because of various economic, social, and religious activities associate with one another on virtually a day-to-day basis. This means that communities can be recognized from geographical and situational data.

The contiguity of houses in Mug House indicates that all of its inhabitants belonged in one community. In addition, there are few other contemporary houses close enough for easy interaction (Hayes, 1964). To the north along the same cliff, about one-third of a mile away, are three small cliff sites, two of them single storage rooms, and the third containing two or three possible dwelling rooms. These sites together could accommodate no more than one household and they may not even have been used on a year-round basis. The nearest house cluster to them (within sight) and the easiest to reach (following the base of the sandstone cliff) is Mug House, and I think it is reasonable to consider these rooms as part of the Mug House community. Possibly they represent a seasonally occupied house nearer some of the fields than Mug House itself.

To the south, about half a mile distant by way of the cliff base or over the mesa top, are Jug House (Site 1283), Ruin No. 18 (Site 1240), and Site 1239. These sites together have 60 to 65 rooms and 3 to 5 kivas. Their inhabitants probably farmed in the same areas, both on the mesa top and on the Rock Canyon talus slopes. They also may have shared water resources and associated in economic activities with the Muguenos.

The nature of the community may be sketched as follows:

In the last period of occupation, that of Component C, Mug House was the focal point for the community. The outlying buildings at Sites 1224, 1225, 1226 may have served as bases of operations and as storehouses near a group of fields on the mesa top to the north of Mug House. A series of toeholds leading upward has been cut into the sandstone cliff near here. The main fields, however, probably lay to the south, where deep loess covers the abruptly widened mesa top, and a third farming area occupies the lower talus slopes and natural terraces in Rock Canyon to the southwest. These last two areas are as close to Jug House and Ruin No. 18 as they are to Mug House.



40 Mug House locality.

Nearby Adobe Cave provided a source of building materials and a sheltered place in which to bury some of the dead. Refuse was dumped down the slope in front of the cave or into abandoned rooms and spaces. Water was collected and stored in a reservoir (Site 1586), about 200 yards south of Mug House. During the frequent dry periods, water was available at Rock Springs, a mile and a half to the north, or from a spring near the bottom of Rock Canyon below Jug House. Although I am not including Jug House and Ruin No. 18 in this community, their possible affiliation should not be overlooked.

During early Pueblo III, the community consisted of the two Component B houses in Mug House cave, one house each in Adobe Cave and Site 1227, and a talus pueblo (Site 1230) northwest of Mug House (fig. 40). Site 1230 contains two kivas and four to six rooms. Probably five or six habitation units are represented. The farmlands and water sources used by the later inhabitants probably served these people also. We cannot be sure that the reservoir had been built by this time.

The early Component A habitation unit in Mug House cave seems to have stood apart from other contemporary houses. A large talus pueblo of 10 to 15 rooms and 1 kiva (Site 1243), situated near the canyon bottom about ½ mile to the southwest among terraced fields, is the nearest such ruin. The association suggests construction of the hillside farming terraces at this time, although the later residents of this area may have used them too.

Whatever the boundaries of the Mug House community, the similarity between its features and those of other Wetherill Mesa sites implies interrelationships within a larger society. The ceremonial flavor of Long House, with its central location, large size, and great kivalike structure, suggests that this site acted as a focal point for some of the activities of all Wetherill Mesa inhabitants.

SUMMARY

In attempting to get some idea of social groupings at Mug House, we have examined the layout of houses and other buildings as revealed by archeological excavation. We have assumed that juxtaposition and routes of access reflect patterns of sharing, cooperation, and interaction, and therefore groupings of individuals. It is impossible to state what qualifications were required for membership in one of these groups, or what relationships bound the individuals together.

From the four kinds of social groupings discernible at Mug House, we can correlate in varying degrees some aspects of social organization at this prehistoric site with modern Pueblo society. For the most part, the parallels are striking, suggesting little significant change. The household occupies the most prominent role in both, and some degree of dual organization is indicated. The modern Pueblo community has apparently grown in size, and has isolated itself in response to inroads by alien people, including the bearers of Western European culture (Dozier, 1964, pp. 90–91). The courtyard unit, however, seems to represent a social unit that no longer exists in modern settlements, and the kiva is now entirely separate from associated houses.

I have tried to relate the foregoing to Pueblo culture as a whole, since we cannot yet determine which of the 26 present-day pueblos in New Mexico and Arizona might be descended from prehistoric Mesa Verde peoples. It is essential to remember that Mug House contained only one group out of many who called Mesa Verde their home, and we have no assurance as to how accurately the picture in this one community reflected the general pattern. It seems likely that most of the 13th-century population of the Mesa Verde was organized in a manner similar to that of Mug House. In any event, the closest parallels occur between Mug House and the modern Keres Pueblos in central New Mexico.

CHAPTER 3

architecture: living and storage quarters

The analogy often drawn between prehistoric pueblos and modern apartment houses is superficial. The modern building is erected at one time, following a carefully prepared plan. The Pueblo builder simply attached his new unit to a convenient portion of others, taking advantage of some existing natural or manmade structures. Only rarely in Mug House was a detached building put up that required six new bordering surfaces (four walls, a floor, and a roof). A natural ground or bedrock surface or a neighbor's roof might act as a floor, a cliff or someone else's house might furnish walls, the ceiling of a low cave might serve as a roof.

The following discussion of living and storage spaces (both termed "rooms"), areas, and courtyards will be organized on the basis of the space itself and the manner by which it was enclosed or delimited. Only those walls specifically built to make a room are considered as a part of that room. A similar criterion applies to features of these spaces. A doorway through the wall of an older building, against which a particular room was built, is not considered a part of the newer room except as a means of access.

Distinctions between rooms, areas, and courtyards were established during the excavation. *Rooms* are relatively small, usually rectangular spaces enclosed by walls and ceilings. They are thought to have housed purely domestic activities, with the few exceptions noted below. *Areas* have no regular shape or size and are bounded at least partly by lines arbitrarily drawn by the archeologist for purposes of space designation. *Courtyards,* like areas, are irregularly shaped spaces formed in part by roofs of subterranean kivas. Both areas and courtyards are partially bordered by rooms, by specially built walls or retaining walls, and by divisions in the natural surroundings, such as ledges or breaks in slope. Positive evidence of domestic use was obtained for all these spaces.

Eighty-two ground floor spaces were numbered as rooms. Several ultimately proved to be parts of courtyards and their number designations were dropped. Upper stories were labeled with the numbers of the ground floor room beneath them, plus /2 or /3. The ground floor room is thus /1, the second story is /2, and any third story is /3. Where the second story was subdivided into two rooms, they are designated /2a and /2b. Rooms were assigned numbers during excavation. These numbers have been retained, rather than changed to read in sequence on our published maps, so that those who may wish to consult the field notes and lists of artifact proveniences will find it easier to do so.

ROOMS

Ninety-four rooms were recognized in Mug House. There may have been as many as five or six more rooms, if some of the present low remnants once stood more than one-story high. Three of the 94 are round "tower" rooms (60/1, 60/2, and 76), apparently associated with ceremonial activities, and one (Room 9) may be a ceremonial room. These four spaces are described in the next chapter. The 90 domestic rooms are discussed in general terms below. They are briefly described, in numerical order, in the appendix.

Size and Shape

Construction of domestic rooms adhered closely to several consistent patterns. Thirty-seven of the 40 dwelling rooms were more or less rectangular. Shapes of the other three had obviously been affected by the space available. The largest covered nearly 88 square feet of floor space, with length and width dimensions approximating 10½ by 8½ feet. Areas in excess of 65 square feet characterized seven others. The smallest rooms have only about 25 square feet, but one dimension always exceeds 5½ feet. The average floor space for the 40 dwelling rooms is between 40 and 50 square feet.

Headroom seems to be another significant dimension. All but one of these rooms have at least part of the ceiling over 3½ feet above floor, while most of the ceilings average 5 to 6 feet high. The highest ceiling is just over 7 feet.

According to the physical anthropological measurements of the Mug House skeletal remains, adult stature ranged from 5 feet to 5 feet 8 inches. This would mean that even the tallest Indian sitting upright on the floor of 39 dwelling rooms would have adequate head clearance in some part of each room. Even the lowest ceiling, 2.2 to 3.0 feet in Room 12/2, would provide adequate head space for a person of short stature. Children, of course, would be able to stand up in most of these rooms.

Storerooms tend to have less headroom and to be less often rectangular in shape than the dwelling rooms. Furthermore, their greatest length is often too short to permit an adult to stretch out full length. However, many do fall within the range of smaller dwelling rooms in one or two attributes. Room 57, for example, is 5 feet high, but both floor measurements are less than 3 feet. Room 37/3 measures more than 9 by 6 feet, but has less than 2 feet of ceiling height.

The largest room, 46/1, apparently served as a turkey pen. It covers about 105 square feet of ground space and is roughly rectangular. The height of its ceiling compares favorably with that of the higher dwelling rooms.

Masonry

Walls were all constructed of stone masonry. Wattle and daub (jacal) and plain adobe are entirely lacking in all the components uncovered in Mug House cave. Blocks of the Cliff House sandstone were laid together in a mud mortar of various fine sedimentary materials that can be found within a 1-mile radius of the site.

A mason at Mug House had several sources from which he could acquire building blocks. The talus slope below the many cliffs was probably always strewn with pieces of rock of approximately the right size and shape that would require only trimming to square off edges and remove unwanted projections. Another possible source was the shelter itself. The back of the upper ledge is jointed in planes paralleling the arc of the backwall and roof. The face had been cleared of debris and broken back to the point where it would have been difficult to quarry the rock any further. Although we cannot be sure that the Muguenos tapped this resource for building materials, we find it hard to imagine their overlooking it.

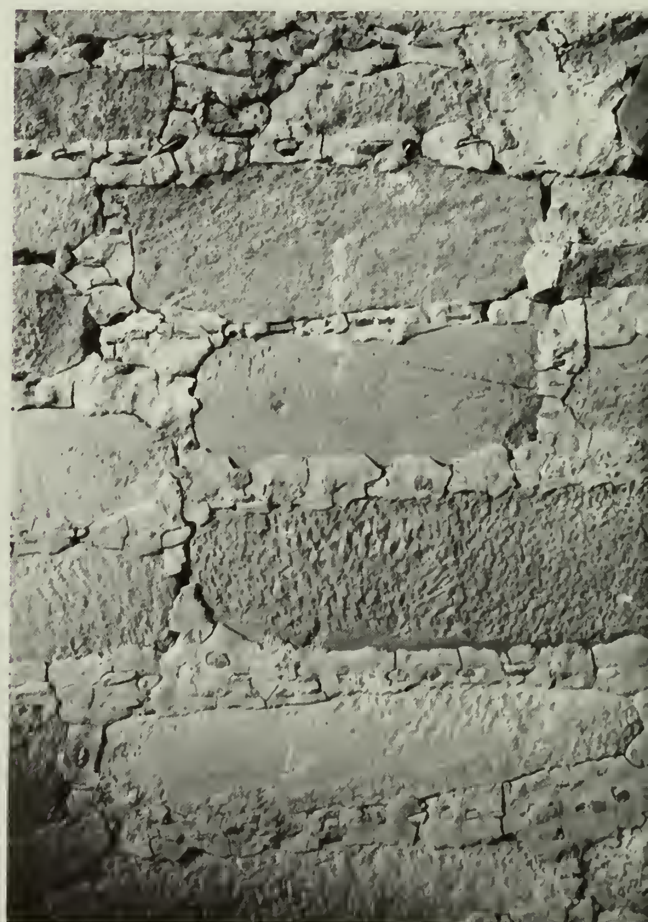
A third source of building stones lay in already existing structures. When someone undertook to build a new house, he could save all the work involved in shaping and dressing fresh stone by simply re-using the materials from an old abandoned house. Almost certainly, unoccupied stone houses would not stand intact very long in a community whose inhabitants were looking for usable building materials. The practice of robbing materials from older buildings and re-using them in newer construction is known to have been common at Mesa Verde in prehistoric times (Lancaster and Van Cleave, 1954), and the evidence from Mug House supports this observation. Many unplastered walls contain stones bearing remnants of old plaster, while some individual smoke-blackened and fire-reddened stones may be found in walls that have not been darkened or otherwise altered by fires built against them.

Excavations around Mug House identified thre houses that had been deliberately razed, with most o the building stones hauled away. The two small cave lying immediately north of Mug House contain onl what was left after razing. The walls of Site 1227 no stand less than 1 foot high above floor level, but the cav is empty of the rubble that would be expected if th walls had simply collapsed through deterioration.

A similar situation exists in Adobe Cave (Site 1228) In addition, two Adobe Cave kivas were partially fille with discarded, unsuitable, and broken building stone chinking spalls, and lumps of wall adobe. No re-usabl building stones were found in this debris, which covere the lower portions of the kiva lining walls, thereby protecting them from complete destruction.

The third house once stood in the center of Mug Hous cave but was completely removed to provide material for the earliest rooms of Mug House and to make spac for the building unit now standing in that spot. Some o the old chipped-edge stones were partially evened b pecking before being incorporated into the new walls

Most stonemasons did not modify their building stone beyond the rough shaping by spalling. Many stones ha one or more naturally flat faces that were alined on th wall exterior to produce a relatively even facing. Occasionally, the mason was not satisfied with the surface o a stone face and evened it by pecking the high point with a stone hammer, leaving small dimple marks o the soft sandstone surface. A certain standard of excel



41 Pecked and ground stones in masonry wall, with spalls used fo chinking; north wall of Room 42/1.

lence undoubtedly stimulated some masons to dimple the entire visible face of each wall stone. The finest example of this can be seen on the north wall of Room 42/1, which had been built to enclose the south sides of Rooms 37/1 and 36/1 (fig. 41).

Although shaping stones into roughly rectangular blocks will produce a stronger wall with thin, even joints, dressing the individual stone faces has no effect whatever on structural stability. A smoother wall face is more comfortable to lean against and does possess an esthetic quality. However, since the more thoroughly dressed stone faces always appear on the exterior wall faces (as in our cited example above), the quality would seem to be most important. A final stage of esthetic perfection was reached by grinding smooth the stone faces. Several of the stones in the Room 42/1 wall exhibit this quality, although it is most often reserved for the stones forming the sides of doorways.

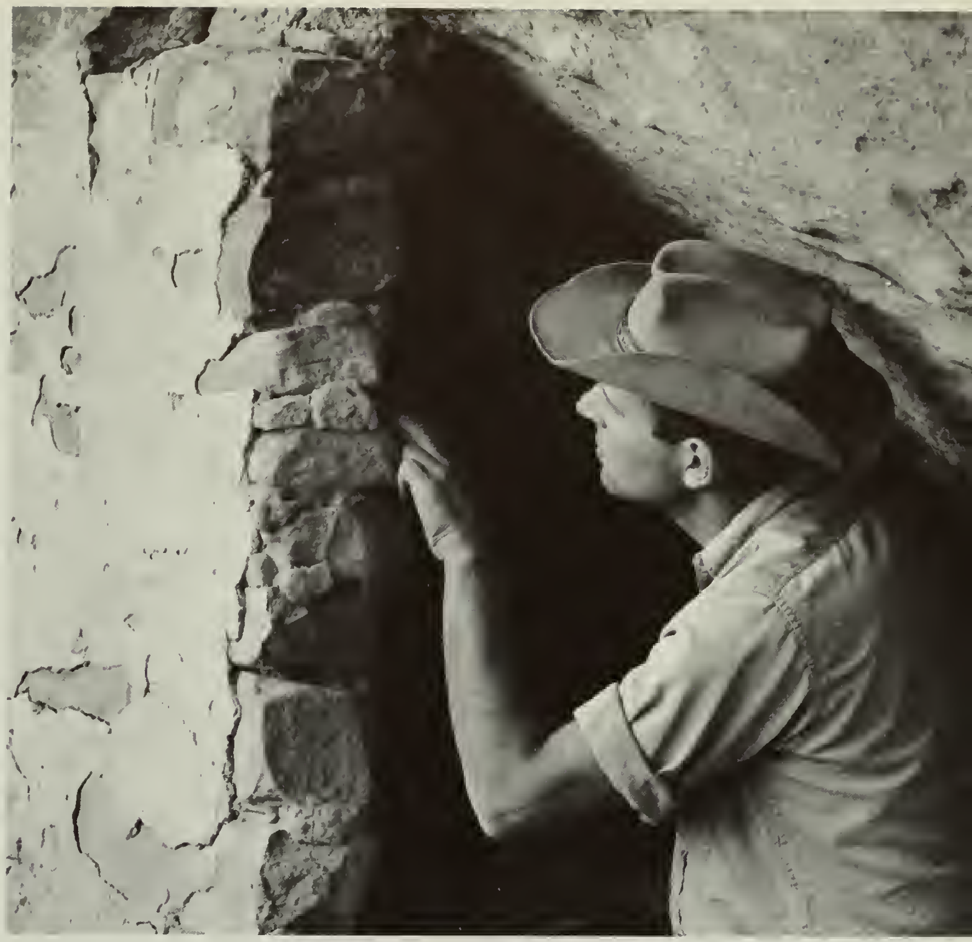
With the building materials assembled, the mason had a choice of several styles of construction. If the building stones were of uniform size, he could construct a wall in which individual stones showed on both faces. I call this a single-coursed wall; some other writers refer to it as a simple wall. If the stones varied in size, only one wall face could be made smooth while the other would be uneven. Many masons accepted this situation, alining the larger and better stone faces on the exterior wall faces of their buildings. Some, though, smoothed the interior face by applying a thin veneer of mud and sandstone spalls over the uneven surface.

Another means of achieving an even face on both sides of the wall, when using stones of various sizes, was to make a double thickness of stones. The thickness of two medium-sized stones could be duplicated by one large and one small one, or even sometimes by one very large stone. The term "double-coursed" as applied to this kind of construction means that each horizontal course of stone laid is primarily two stones thick. Other archeologists on the project refer to such a double-coursed wall as a compound wall.

The practice followed in Mug House duplicated that used on single-coursed walls of placing the larger and better stone faces on the exterior wall face. Smaller stones of appropriate size were then fitted to the interior. Very small stones on the interior of a double-coursed wall are occasionally difficult to distinguish from the veneer of a single-coursed wall containing large spalls.

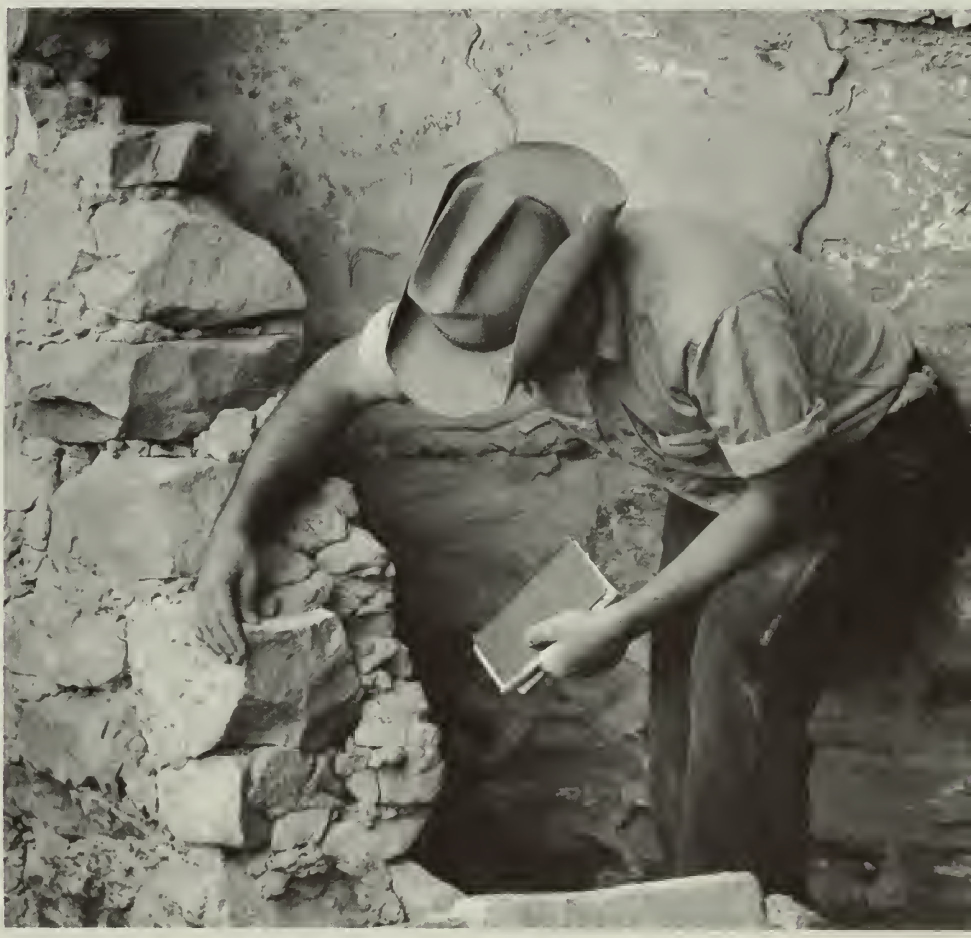
Approximately two-thirds of all walls of Mug House domestic rooms are single-coursed (fig. 42), with about equal representation in both dwelling and storage spaces. Only 4 walls have an allover veneer on the interior face—2 in Room 25 and 2 in Room 37/2—but 10 other walls in Rooms 10/1, 12/1, and 11/1 are partially veneered. All of these rooms belong to the two earliest units of Mug House, suggesting that the practice of veneering wall faces died out with the appearance of double-coursed walls.

Double-coursed walls (fig. 43) appear most consistently in dwelling rooms; only five (21 percent) form part of storage rooms. A converse relationship is seen in the



42 Single-coursed (simple) wall construction, with white plaster on exterior; Room 28.

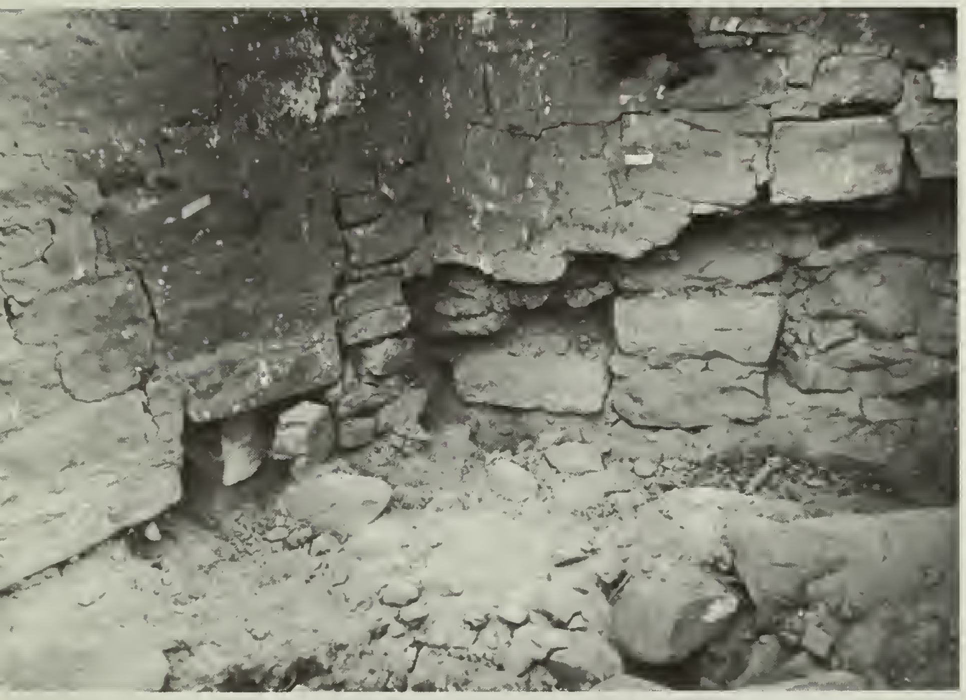
43 Double-coursed (compound) wall construction; Room 23.



use of the unmodified cave or cliff wall as one side of a room. Thirteen (33 percent) of the dwelling rooms employed this feature against 20 (61 percent) of the storage rooms. By taking advantage of the natural cave walls and the already existing walls of neighbors' houses, the average builder needed to erect only two or three new walls.

The dichotomy between single- and double-coursed walls is far from sharp. I have already mentioned the difficulty in distinguishing a heavy veneer from the small-stone face of a double-coursed wall. In fact, several double-coursed walls would stand just as well with only one thickness of the larger stones used on the exterior face. The double thickness does little more than provide a smooth interior face.

One of the stabilization problems encountered at Mug House required the replacement of part of one such thick veneer at the base of the west and south walls of Room 37/1 (fig. 44). Although they appear to be double-coursed, these walls could have been built as thick single-coursed walls evenly faced only on the exterior, with the later addition of a thick veneer. Should the interior face be stripped off, nothing would be lost in the way of sturdiness or stability. Similar walls are found in Rooms 24/1 and 36/1.



44 *Stone veneer "peeling off" interior masonry walls; Room 37/1.*

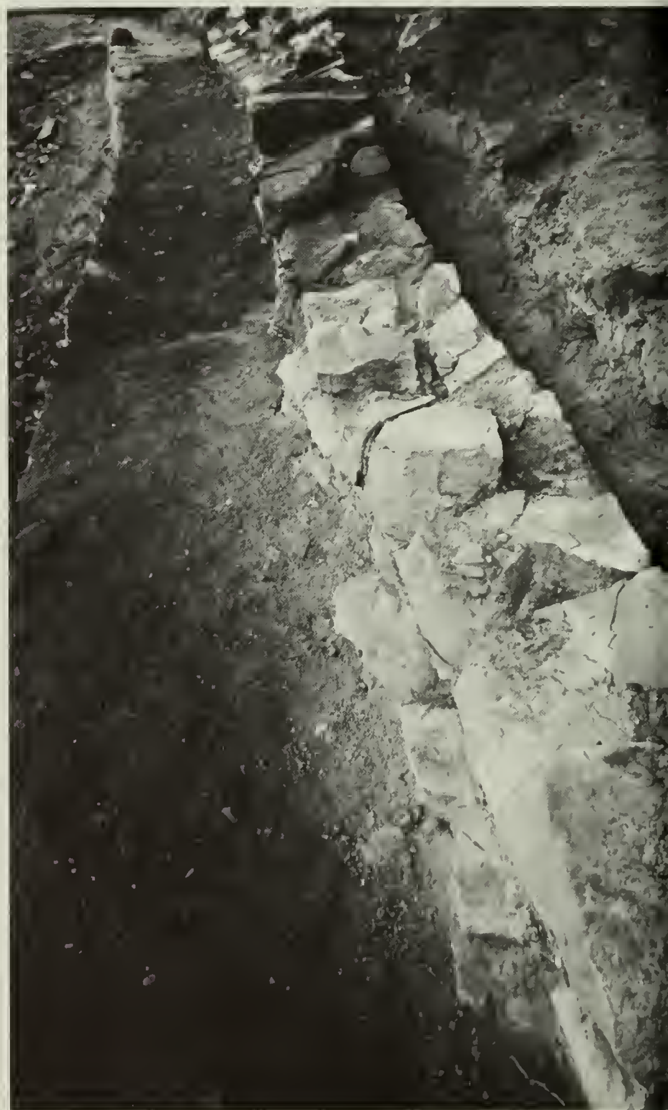
Large, thick sandstone slabs, set on edge, formed the base of three walls in Mug House: the west wall of Room 29/1, the south wall of Room 47, and the north wall of Room 37/1. Typical single-coursed masonry then carried these walls up to the desired heights. This kind of construction is found sporadically in late Pueblo III cliff dwellings and in late Pueblo II mesa-top masonry houses throughout the Mesa Verde area (Fewkes, 1923, p. 110). Large, horizontal stones, too heavy for one man to lift, were also employed in some wall bases.

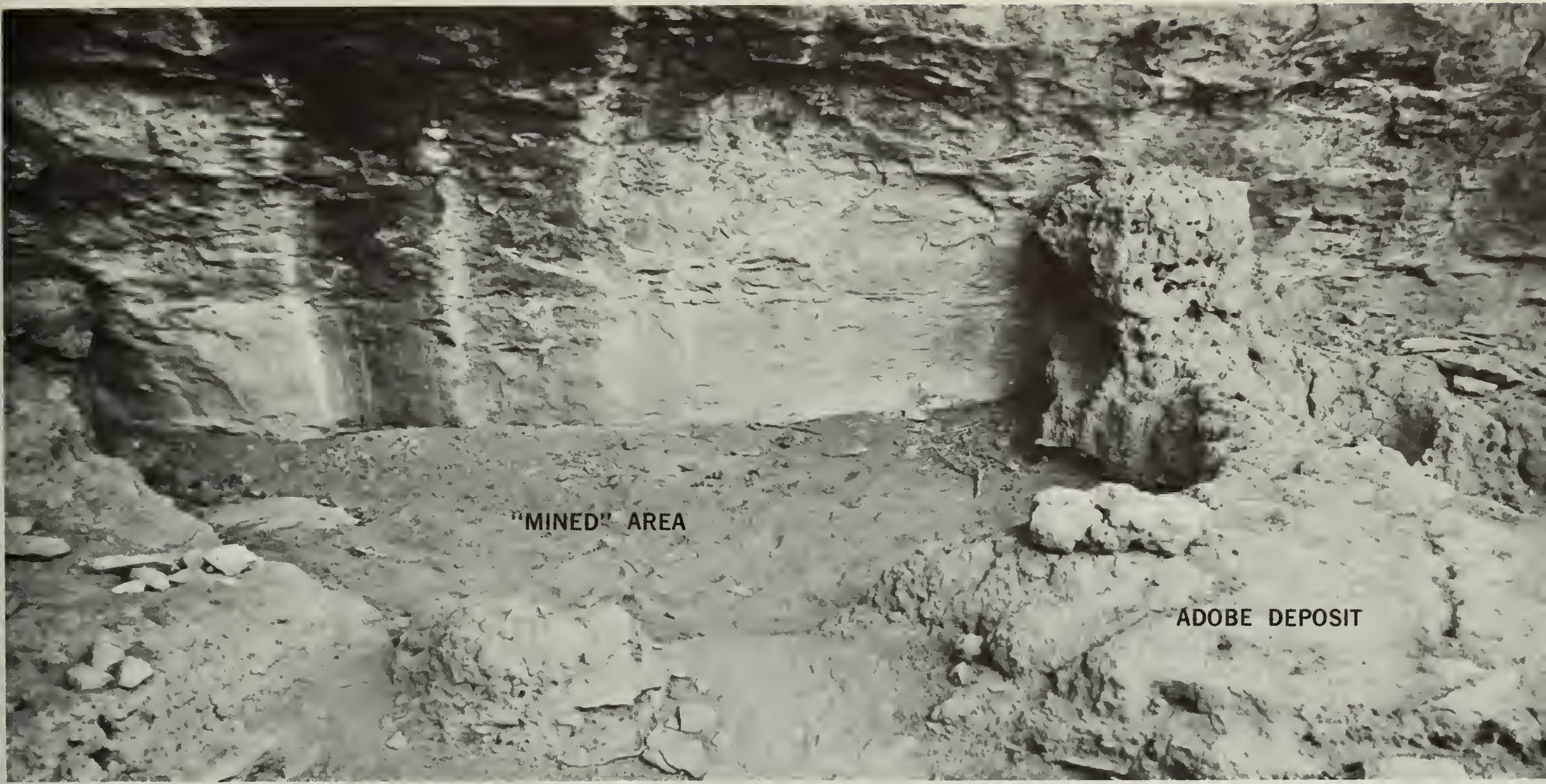
Rarely were special footings prepared for the stone walls. Most walls were footed at floor level on whatever material happened to be there—bedrock, or natural or artificial fill. Twice, though, special footings of rough stones were set into a shallow trench about two-thirds of a foot wider than the contemplated wall. When excavated, this single layer of stones projected irregularly beyond both wall faces (fig. 45). Footings were found beneath the long walls that formed the west sides of Rooms 62, 63, 66, and 58.

Mortar varies considerably from one wall to the next. We have identified at least three, and possibly four, different sources of fine loam deposits suitable for use as a binding agent between the stone building blocks. Color has provided the primary clue, although texture proved useful too.

The earlier masons seem to have preferred soils from the mesa top. The common red loess that covers so much of the mesa makes an excellent adobe and was used in various combinations with other materials. Alone, it shrinks excessively in drying, but the addition of some sand or sandy soil reduces this shrinkage. A yellow or buff, residually formed soil, containing a wide range of particle sizes from very fine loam to fine sand, occupies the very narrow mesa top directly above Mug

45 *Footing of rough stones under double-coursed wall; Room 62.*





46 *Adobe deposit at rear of Adobe Cave.*

House. This material makes a fine mortar without additions and probably accounts for the light colors such as buff and light tan. Various combinations of these two soils produce a considerable range of colors, usually with a pink tinge. During the stabilization of Mug House, we found most colors of mortar could be duplicated by mixing different proportions of these two soils.

Darker tans and browns, however, could only be approximated by the addition of water-deposited sediments that we dug out of one of the partially exposed kivas. These sediments closely parallel in composition and makeup a series of sediments that have filled a large portion of Adobe Cave. An old remnant of some of the finer sediments stands above the present cave floor and is easily accessible. A large section has been removed from the center of this remnant (fig. 46), and the presence of digging-stick impressions along one side, plus a pair of puddling basins (fig. 47), indicates prehistoric use of this resource. The mortar of several Mug House walls exactly duplicates this material, pointing to the Muguenos as the exploiters. This Adobe Cave material may also have been used in mixtures with red loess.

The fourth material could not be confused with any other and was apparently not used in combination with any other. It consisted of crudely crushed shale softened in water. The source may have been the same one used for pottery clay—a shale lens in the Cliff House sandstone—and may have been located adjacent to the cave. These shales will soften when soaked in water and form a dough-like mass containing numerous small flakes that refuse to soften. A potter would need to grind the shale to produce an even-textured body for a clay vessel, but a mason could use the unground material.

47 *Two puddling basins near adobe quarry in Adobe Cave.*

Relative building dates of the various architectural units in Mug House rely primarily on inferences derived from wall abutments and relative position, and cannot be precisely stated for all structures. It is possible, nevertheless, to recognize a general trend in changing preferences of material for mortar. The earlier walls usually contain a combination which includes red loess. This gives way only partly to the many shades of buff, tan, and brown. The blue-gray shale appears only in walls of later date, but all of the materials seem to overlap one another. This trend could be interpreted as a tendency for people, whose ancestors had lived on the mesa top and had used the handy mesa-top soils in building walls, to continue to use familiar materials, even after they had moved to a different location. The discovery of new sources closer at hand probably influenced the changes.

Mesa Verde stonemasons characteristically chinked with small stones the mortared seams between building blocks. In Mug House, several clear patterns of behavior are discernible in this practice. The most significant is the restriction of chinking to walls enclosing domestic spaces. The walls of kivas and towers were never chinked. This suggests a nonutilitarian value for the practice, although kiva and tower masonry presents extremely narrow joints. It might be argued that giving less attention to shaping stones for domestic masonry resulted in larger joints, which could only be stabilized by the employment of small stone spalls. Furthermore, chinking spalls span cracks formed by shrinkage of the mortar in drying.

Our experience in attempting to reproduce the appearance of the prehistoric walls during stabilization of the ruin has verified these observations, but they do not satisfactorily explain all the features of the chinking. Several living room walls contain seams as small as those in kivas, and they have been chinked. Density of chinking in room walls does not correspond regularly with the size of the joints or the amount of mortar placed between stones. Some of the roughest walls in storerooms are only sporadically chinked, while neatly coursed walls, built with a minimum of mortar, contain regularly spaced chinking stones in every seam.

48 Red sandstone spalls in west wall of Room 25, possibly for decoration.

A certain standard of excellence may have influenced the specific nature of chinking in any one wall. There is a definite correlation between the better wall facings and regularity of chinking. The specific visual effect must have been intentional, perhaps as an expression of individuality. For example, a cluster of bright red sandstone spalls was set into the topmost mortar above the doorway to Room 25 (fig. 48), while all other chinking spalls in the wall are orange-brown. Corncobs and their impressions appear commonly in some walls. The east wall exterior of Room 14 has five cobs and six impressions. Smoke-blackening in one of the impressions indicates removal of the cob prior to abandonment of the site. Other items used in chinking include potsherds and one small wood chip in Room 12/1.

Plaster

We recorded plaster in 23 of the 32 dwelling rooms whose walls were intact enough to have preserved any that might have been present. It was seen in only one storage room and in another room that could have served for either dwelling or storage. Plaster also coated wall exteriors around the doorways of four storerooms and two storage or living rooms.

Plaster never concealed the smoother and more appealing exterior wall faces. Instead, it was mainly applied on the less attractive interior wall faces of most dwelling rooms. Interior walls of storerooms, not generally seen, were not plastered.

Several patterns of plastering can be distinguished among the skimpy patches of wall plaster still visible. These include a monochrome pink or tan coating on all four walls (fig. 49); a complete coat on only one or two walls; and a partial coat covering only the lower one-quarter to one-half of the four walls. Preserved remains are not sufficient to justify any speculations on the relative occurrence of these variations.

Two rooms had bichrome plaster. The lower parts of Room 46/2's brown-plastered walls were painted red. In Room 24/2, a series of dot-outlined triangles extended upward from the purplish-red lower zone into the white-painted upper part of the walls. In both rooms, however, monochrome plaster underlay the bichrome.

Plastered surfaces generally exhibit scoring, as if the thin coats had been applied by brushing. Hand-smoothing marks are absent. Many surfaces are blackened by soot. Several coats of plaster are common. One interesting feature is the consistent appearance of pink plaster, even on walls that have later types of mortar. Apparently the red loess from the mesa top continued in fashion for plastering after it had gone out of style as mortar.

Roofing

In spite of the excellent state of preservation of most of the walls, no roofs completely survived both the natural and human ravages of the past seven centuries, except where the unmodified cave ceiling acted as a room roof. It was possible, however, to infer a great deal about roofing from various remnants adhering to walls, from empty sockets in which roof timbers once rested, and from the collapsed debris often found in the room fill.

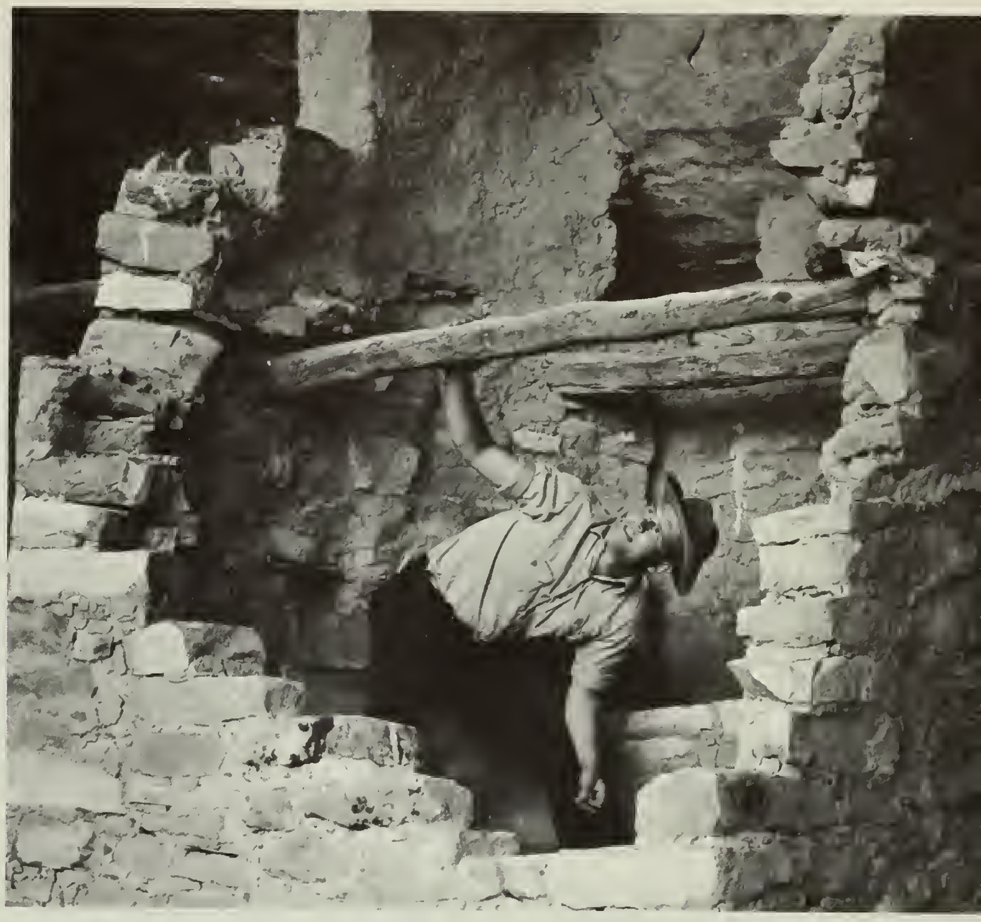
Builders of 48 rooms used the low, vaulted cave roof for a ceiling. Of the 42 rooms requiring artificial roofs, 22 had completely disappeared and the other 20 are known only from wood fragments and adobe impressions found in the fill.

All the artificial roofs apparently rested on timbers set into the tops of the stone masonry walls and spanning one of the linear dimensions of the room. Most of these beams seem to have been set in place during construction of the wall, but seats were occasionally chiseled out of an older wall when a newer room was built against it (fig. 50).

One style of roof rested on a single large beam running across the center of the long dimension of the room. Pairs of smaller poles, averaging 3 to 4 inches in diameter, crossed the room's shorter dimension. These poles extended from the center beam to the sidewalls. As many as nine pairs of poles formed this secondary layer. One pair always lay against each end wall. A third layer of shakes—shingles split from short logs—spanned the 1- to 1½-foot space between the poles, at right angles to them. This layer provided a continuous surface on which 0.2 to 0.3 foot of adobe, identical to that used for wall mortar, was placed. Roofs of this sort covered Rooms 10/1, 11/1, and 12/1. Room 40/1 may have had a similar roof, but the lack of secondary pole sockets in its one intact sidewall suggests there may originally have been three lengthwise main beams instead of the one that can still be seen. The end walls are broken where these other two would have had to be set.

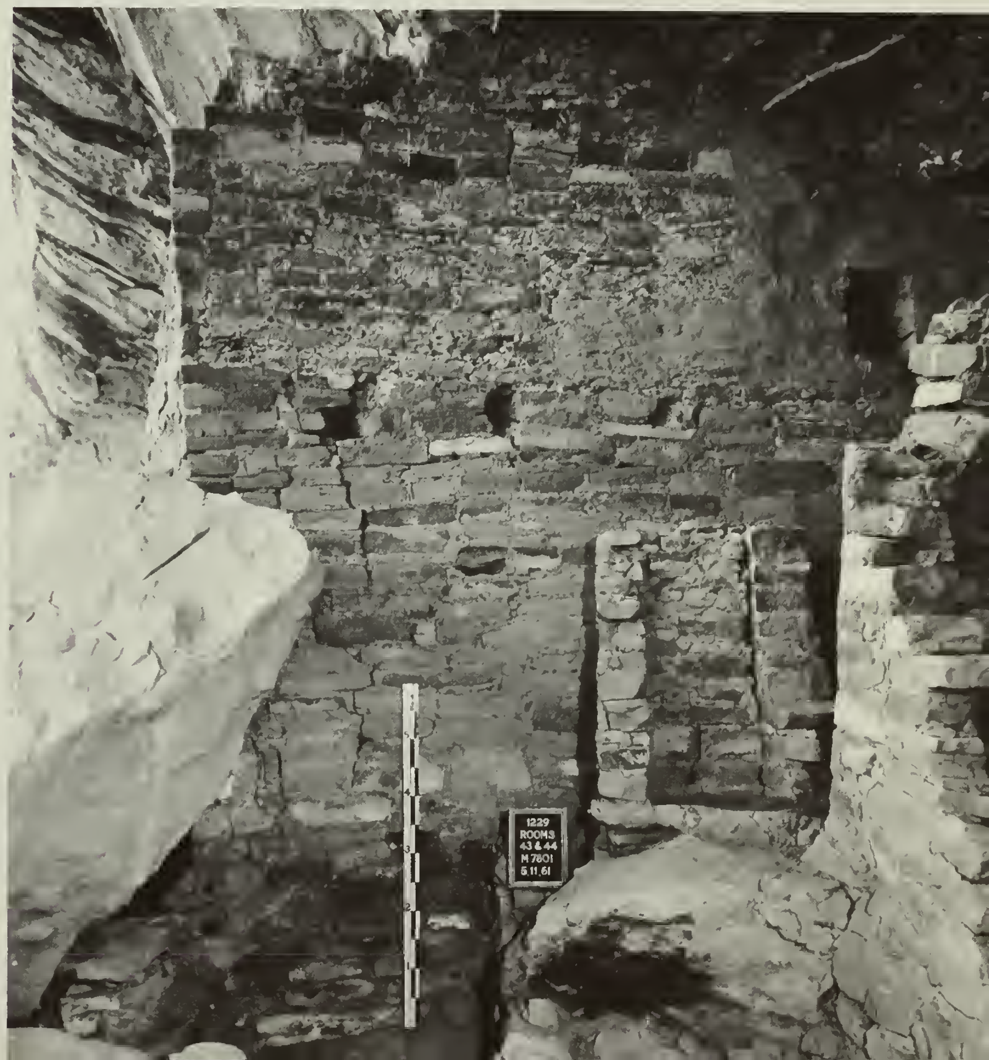
A second roofing style has two or three large beams across the short dimension, with four to six secondary poles running the long way. We have no way of knowing whether these secondary poles were used singly or in pairs, and whether more than two lengths were needed to traverse the longer dimension. They were set in the walls of Rooms 37/1 and 37/2, but against the wall in Room 45/1 (fig. 49). A layer of shakes covered the secondary poles in Rooms 37/1, 42/1, and 45/1, whereas twigs and brushy stems were used for Room 37/2. Evidence of juniper bark layers was seen in adobe impressions from Rooms 42/1, 44/2, and 45/1, but the roof adobe in Rooms 37/1 and 37/2 lay directly on the shake or twig layer.

Roofs over Rooms 15/1 and 46/1 resemble both these styles. In Room 15/1, five large beams (actually six, but wo are bound together by yucca strips and function as one) stretch across the width of the room, one against each end wall and three in the middle. Since these timbers were only 1.5 to 2 feet apart, the layer of shakes rested directly on them, topped by adobe. In Room 46/1, where the cave wall forms one side of the room, a large imber placed against the bedrock face serves as a support for several large transverse timbers, probably like hose in Room 15/1. Successive layers of secondary poles, hakes, and adobe lay atop these main beams. The en-



49 In-place roof beams in Room 45. Monochrome plaster covers second-story walls.

50 Roof-beam seats cut into existing walls; Room 44.



tire roof of Room 57, a small storeroom, consisted of layers of shakes and adobe resting on three small poles set into the room walls.

The relative popularity of shakes versus twigs and brushy stems, and the proportionate use of juniper bark as an added layer in roofs, can be stated for the 20 instances for which we have some direct evidence. Twigs were found exclusively in five ceilings, possibly a sixth, and combined with shakes in one. Shakes were used alone 14 times and in combination once. Juniper bark occurred in only 4 of the 20 cases. Neither twigs nor bark formed a part of the ceilings in the four earliest Mug House rooms—10/1, 11/1, 12/1, and 15/1.

In all 20 examples, the adobe layer ranged in thickness from 0.2 to 0.4 foot. The materials were the same as those employed for mortar in stone masonry walls.

Well-preserved room roofs in Spruce Tree House on Chapin Mesa seem to fit rather neatly into a twofold grouping based on the use of one main beam placed longitudinally as opposed to two or more main beams running in a transverse direction. Both groups have secondary pole layers set into the walls, covered by shakes or twigs and adobe. A second consistent association, however, finds juniper bark placed on top of twig layers, but never apparently on the shakes.

Roofing materials varied, although juniper surpassed all other woody plants combined. Juniper was employed for the large main beams and secondary poles, it was the only wood split into shakes, and its bark was used in the occasional bark layer. The largest juniper log left in place in Mug House measures 12.6 feet long and averages from 0.3 to 0.5 foot in diameter. There were once probably others of similar size.

Douglas-fir and pinyon are the only other species we found used for primary and secondary timbers; ponderosa pine is noticeably absent. Woody shrubs represented in the twig and stem roofs include serviceberry and willow predominantly, with scattered pieces of mountain-mahogany, oak, mockorange, chokecherry, and possibly big sagebrush. The great predominance of serviceberry and willow shows they were clearly preferred among the local plants, which grow in the vicinity of Mug House in much different proportions today than was indicated in the prehistoric roofing debris. Further selectivity may be seen in the absence of fendlerbush from the roster of construction materials, although it is plentiful today within 200 yards of Mug House.

Flooring

Like roofs, flooring may be divided into unmodified natural surfaces and artificially constructed surfaces. At least some remnant exists for almost all 90 floors. Bedrock sandstone formed all or part of 24 floors. Half of these have patches of adobe or tightly packed earth where low spots had been filled in, or possibly where the entire surface had once been coated with a smooth plasterlike layer. Only in Room 11/1 was some of the surface pecked to make it more even, and then partly covered with tightly packed earth.

Most room builders constructed artificial surfaces by packing down a layer of earth (7 floors), or by spreading a layer of adobe up to 0.1 foot thick over a leveled earthen surface and smoothing the top, possibly with stones (27 floors). All 23 upper-story rooms used the top adobe layer of the roof of the room below as a floor, thus raising the total of adobe floors to 50. We found no definite flooring in nine ground floor rooms, but originally these could have been loosely packed earthen surfaces that subsequently disintegrated. The turkey pen (Room 46/1) may never have been floored.

The majority of adobe floors were broken. Walls collapsing on them as well as extensive digging by early artifact prospectors are undoubtedly responsible for much of the damage. Some floors, however, could hardly have been affected by either of these actions. It seems probable that some damage was done to floors by the Indians themselves, probably after the individual rooms were vacated.

Sandstone slabs had been set into the adobe surface of three floors but not fitted to resemble flagging. Floor adobe duplicated the materials found in wall mortar—red loess from the mesa top, brown loams probably from Adobe Cave, and crudely pulverized blue-gray shale. Wherever wall-floor junctures could be observed, the floor adobe rounded neatly into the wall face or plaster. The lowest point of each floor appeared to be near the center of the room.

There seems to be only one significant association of floor style and room function. About two-thirds of the bedrock occurs in storerooms, but this is partly a function of the placement of storage spaces toward the rear of the overhang in places where headroom is limited. However, there is a slight tendency to make use of *unmodified* bedrock surfaces in the storerooms, where a similar surface in a dwelling room would at least be partially coated with some special material. In the dwellings, human bodies would be expected to come in contact with the floor regularly, and a bedrock surface retains cold longer than an earthen or adobe floor.

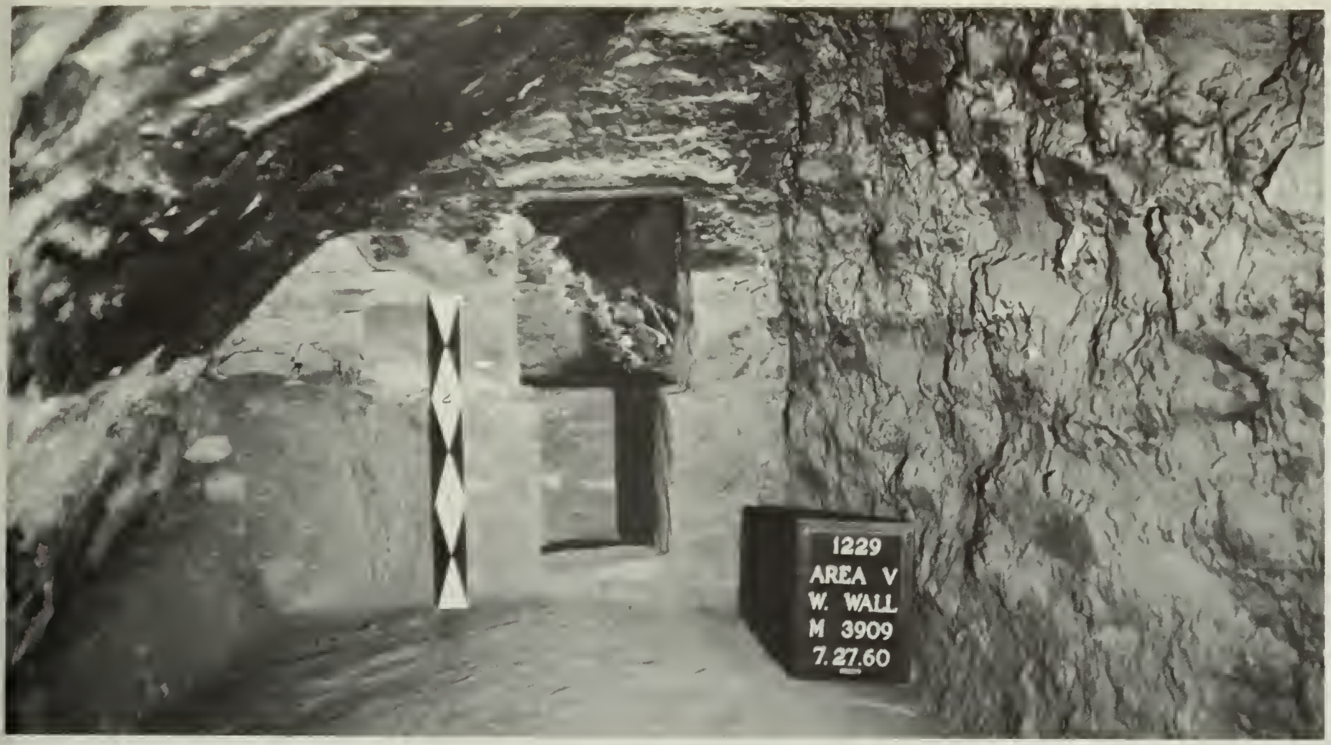
DOMESTIC FEATURES

A wide variety of features was recorded in the various rooms. But it should be emphasized that no one room contained examples of all or even a majority of these features. Several rooms in which no features were noted must at least have had doorways, although all traces of them have completely disappeared.

Doorways

Although it may be assumed that every room had an entrance of some sort, only 37 doorways were found by the excavation crew in 1960. It is possible that hatchways through the roof were used in some cases, but no positive evidence for this was found. The walls of Rooms 77, 73/1, and probably 44/1 stood higher than usual doorway height on all four sides, yet contained no sign of a doorway or roof entrance.

Only five doorways are T-shaped, all of them leading into dwelling spaces in widely separate parts of the ruin. In general, they are larger than other doorways and are



51 Large T*-shaped doorway between Areas V and VI.*

constructed with somewhat more care. They range from 2.9 to 3.7 feet high, with offsets on both sides at 0.7 to 1.0 foot above the sill. The two complete examples measured 1.4 and 1.7 feet across the tops and average 0.4 foot less in their lower, narrower portions. Sandstone slabs formed both the extant lintels. Traces of small sticks, which spanned three doorways immediately beneath the lintels, provide the only suggestion that door slabs may have been set in them. This seems unlikely because of the difficulty of making T-shaped door slabs (none were found). The small sticks may simply represent a convention. Sills always stand about 1 foot above floor level, except for the large doorway between Areas V and VI (fig. 51). This opening was first built when bedrock formed the use surface and the sill was 0.2 foot above it. The occupants of Areas V and VI proceeded to gradually fill the spaces with debris, packing it down through use into successive series of walking or use surfaces, each of which tended to reduce the height of the doorway. By the time the latest use surface was formed, the opening stood only about 2 feet high and had a rectangular shape.

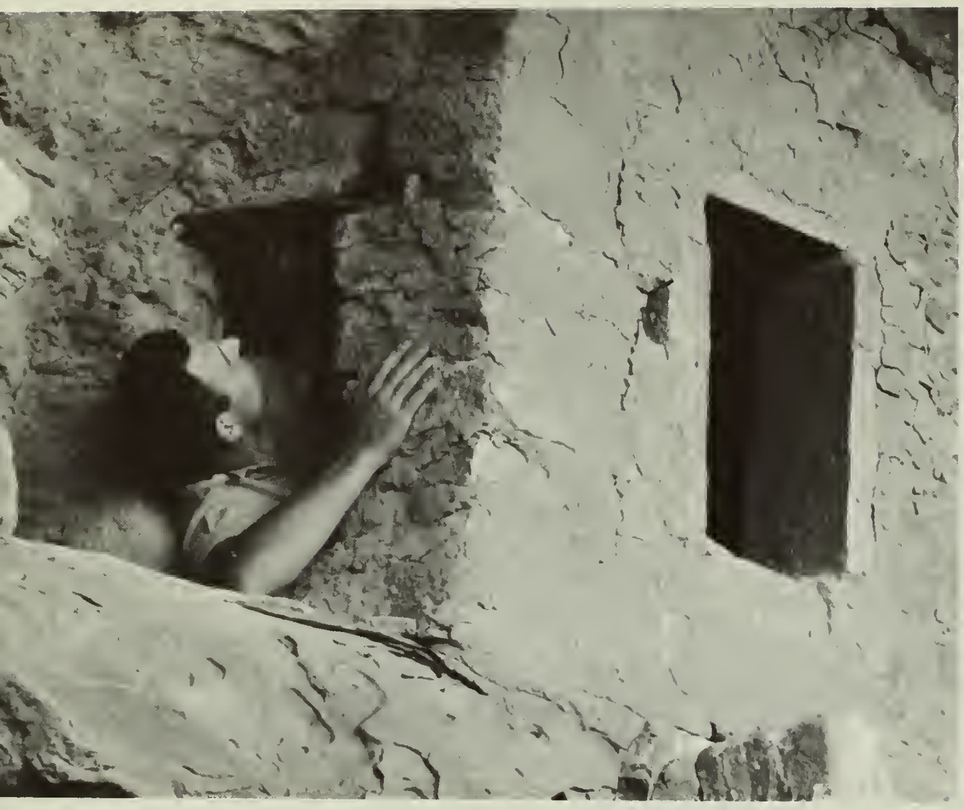
Rectangular doorways outnumber those with a T-shape by 6 to 1. The former was the only kind that led into storerooms (13 instances) or spaces that might have been used either for storage or some other purpose (7). Twelve opened into dwelling rooms, with 11 of these measuring from 1.7 to 2.3 feet high and 1.3 to 1.6 feet wide. The lone exception is a floor-level opening between Rooms 62 and 63, 2.0 feet wide and more than 2.1 feet high. Storeroom ports average slightly less, with openings as small as 1.0 foot wide by 1.5 feet high.

At first glance, such small openings would appear difficult to pass through, but a little practice soon reveals how easy it can be. Wherever possible, the Mug-uenos placed their door sills about 2.2 to 2.8 feet above floor levels. This enables one to step high over the sill with one leg, follow it with the arm of the same side, and one's head, and pass through without a pause. Even a stout person can navigate most doorways in this fashion. Where headroom was restrictive, sills had to be placed lower, but any sill height over 1 foot would allow this kind of passage. It is only when sill heights are less than 1 foot that one is forced to crawl through on hands and knees. Under these conditions, the breadth of one's hips becomes a limiting dimension.

Most doorways were constructed as a part of the wall through which they provide access. Normally the ends of wall-building stones were carefully alined and dressed by pecking or grinding, or both, to form jambs, but occasionally the rough ends remained undressed. In one instance, however, an entranceway was cut through the once solid wall to Room 36/2 from 42/2, leaving the roughly cut ends of the building stones unmodified.

The simplest way to face the jambs for a doorway was to stand upright two tabular blocks or slabs of sandstone (fig. 52). If these blocks were selected carefully, the lintel could be laid directly on top of them, but often one side needed a small amount of masonry to raise it to the desired height. Two of the seven doorways where this method was employed had upright stones on only one side. None of them led into dwelling rooms. Jambs such as these are found in all temporal contexts within Mug House. In general, more work and care were expended on the shaping and dressing of doorway stones than on stones to be used in the remainder of the walls in which they are located. Wall surfaces were often plastered only around the doorways.

Stone sills are universal in Mug House, but they vary from the simple utilization of the top surface of a large



52 Rectangular doorways, with slab jambs in one at right; Room 50.

53 Wooden lintel; Room 36/1.

wall block to the special placement of a thin slab that protrudes slightly on one or both sides. The latter practice produces a somewhat more durable result.

Lintels were constructed either with long stone blocks or slabs (20 instances), or by using several split or whole poles (6 instances). All the wooden lintels appear in the two older house units and were built prior to any of the five T-shaped doorways. Three split juniper poles with the round side down formed three lintels (fig. 53), and a fourth consisted of five complete juniper poles. The fifth was made with five serviceberry and one mountain-mahogany sticks, while the last was indicated only by impressions of three poles. All the wooden lintels were capped by sandstone slabs or blocks resembling the all-stone lintels.

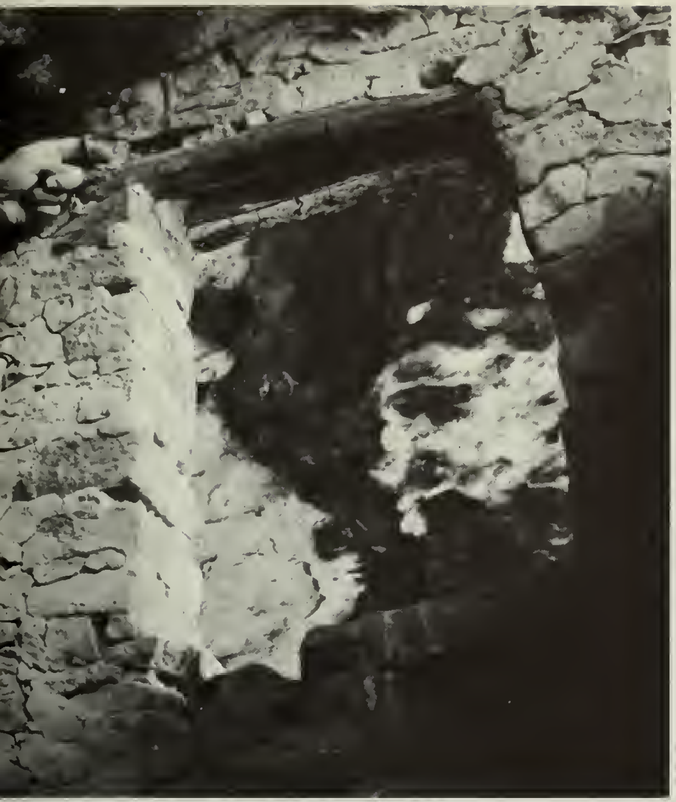
All rectangular doorways seem to have been designed with some means for closing them, primarily from the outside. The doors were apparently sandstone slabs, with one exception. Suite 11/2, in the early section of the ruin, presumably had a flexible curtain or mat suspended from a horizontal pole held in place above the doorway by two oak loops mortared into the wall (fig. 54). A second pair of oak loops halfway between sill and lintel may have held a stick horizontally to keep the hanging material from blowing in the wind and to bar the door. This appears to be the only doorway that was intended to be closed from the inside.

Use of door slabs is indicated by the presence of mud and stick collars built inside the openings, small sticks or poles lying across the top of the openings immediately below the lintel and probably serving as doorstops, grooves worn in sills and some jambs, and many sandstone slabs of various sizes. The simplest form of doorstop consists of a single stick spanning the opening between the tops of the jambs (fig. 55). Occasionally, two such lintel sticks form a groove into which the top of the door slab could be inserted, the second stick preventing it from falling backward. Slanting mud ridges added to the jambs acted as a doorstop and at the same time blocked the cracks along the sides of the door through which drafts could leak. The most elaborate stops incorporated lintel sticks and sloping sticks at the jambs into massive mud-covered frames that sealed all gaps around the in-place door slab (fig. 56). Grooves in the sills kept the slabs from sliding out of their tilted position, while similar one-sided grooves in the jambs occasionally substituted for mud ridges as stops.

Several doorways appear to have been equipped with a means of "bolting" the door from the outside. Traces of oak loops mortared into the wall in the middle of both sides of the openings were recorded for at least five portals. After setting a door slab in place, the owner could slip a stick through the two loops across the center of the doorway, thus preventing the slab from tipping backward. Both dwellings and storerooms had these loops, but they seem to be more common in the earlier buildings (Rooms 11/1, 15/2, 36/1, and 25). Room 50's pair belongs to one of the later construction units.

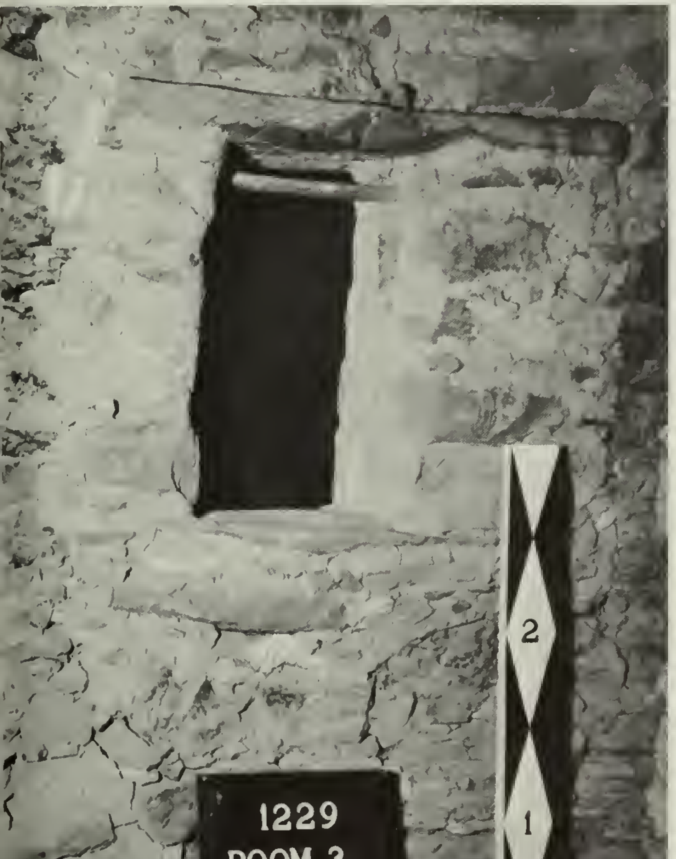
Preserved, but mostly fragmentary, doorstop materials in 19 doorways have been identified as serviceberry (9), juniper (6), oak (6), and single specimens of mountain-mahogany, mockorange, saltbush, and elderberry. In spite of the wide variety of species represented, definite preferences for certain plants seem to characterize different household blocks. For example, all specimens found in Suite 1 are serviceberry, while juniper and oak predominate in some other units.

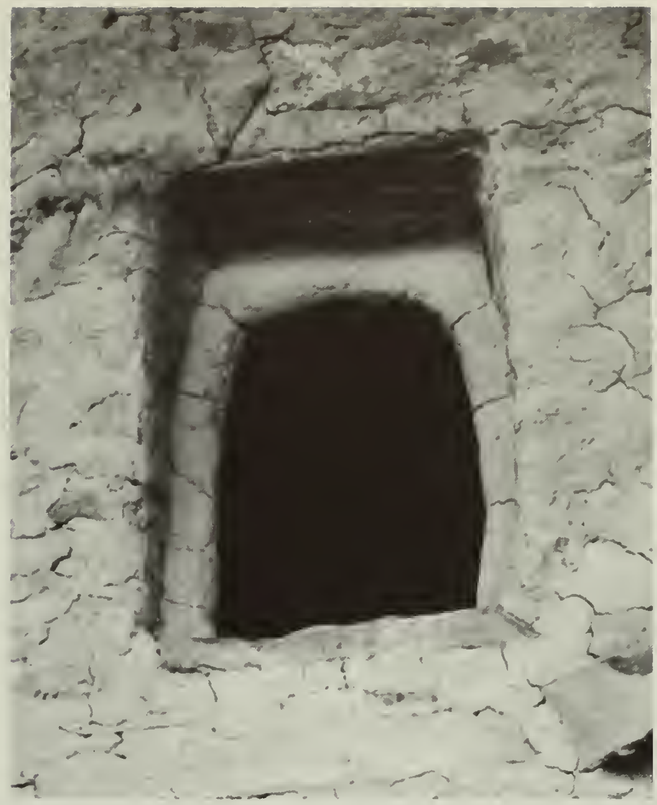
Old digging sticks, or long fragments of them, enjoyed special prominence as lintel sticks. Five specimens *in situ* and clear impressions of three others were observed in five doorways. This practice may reflect re-use of worn-out tools or a social value or custom which dictated that agricultural implements should be built into a house on specified occasions.



54 *Oak loops around doorway; Room 11/2.*

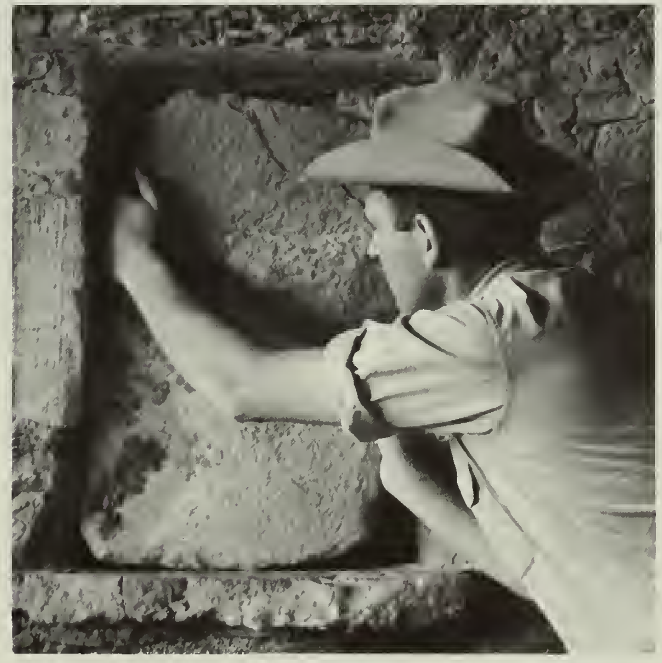
55 *Stick across top of doorway into Room 3.*





56 *Mud-covered frame in doorway into Room 20.*

57 *Stone door slab.*



Door Slabs

Forty-six worked stone slabs, 26 of them broken, were found which were nearly identical in size and shape to that of the various rectangular doorways (fig. 57). They range in thickness from 0.04 to 0.2 foot and are made from thin tabular slabs of the Cliff House sandstone. Some edges are unmodified, but bifacial spalling is found on one or more edges of 44 (96 percent) and grinding on 28 (61 percent) of them. The two slabs without any traces of spalling had well-ground edges. Only one slab showed signs of pecking on its edges.

The large flat faces of the slabs were left unmodified on 12 (26 percent), while 31 (67 percent) were ground smooth, either over the entire surface or just on the high spots. Three surfaces were pecked.

It is possible that a number of these slabs were not intended for use in closing doors, although most of them can hardly be interpreted otherwise. One slab has evenly pecked faces and does not seem to belong with the rest. The many different kinds of worked slabs discussed in chapter 10 suggest that stone slabs of this nature might find uses other than those implied by their shape and size.

Ventilators

Other wall openings were far less common than entranceways and served a variety of purposes. Six small floor-level ventilators were found in upper ledge rooms, five of them in the four Component B rooms. These small openings average about 0.4 to 0.5 foot square and are simply small gaps left in the masonry with one of the larger building stones acting as a lintel. They could easily have been closed, or the opening reduced in size, by leaning a small sandstone slab against the wall or by slipping a small plug into the opening. Their floor level positions prohibit looking outside unless the viewer is proficient at standing on his head.

One ventilator is noteworthy for its separately built masonry shaft rising 2.1 feet vertically outside the east wall of Room 11/1. Two crossed sticks (old digging-stick fragments of serviceberry) extended across the diagonals of the opening. Apparently this peculiar ventilator, which opened into the back of the cave, was part of the original construction of Room 11/1 but had been plugged from the inside when no longer desired. Room 13 was subsequently built on top of the vertical outside section. A small aperture in the base of the west wall in Room 11/1 subsequently provided ventilation.

Smoke Holes

Smoke holes, at ceiling level, were definitely observed only in Rooms 45/2 and 46/2, with the aid of mud lines and smoke blackening on the cave roof. It seems likely that other rooms might have had this feature too, but the upper parts of the walls and the ceilings are always the first to crumble. Even where the cave roof covered some rooms, breaks in the upper walls may have been the result of natural deterioration, or they could have been encouraged by the existence of an opening such as a smoke hole.

Loopholes

Only three loopholes—small openings admitting light or air, or permitting observation—are recognizable in still-standing room walls. Either they were rare, or most of them were in walls that have collapsed. I am inclined to believe there never were many in Mug House.

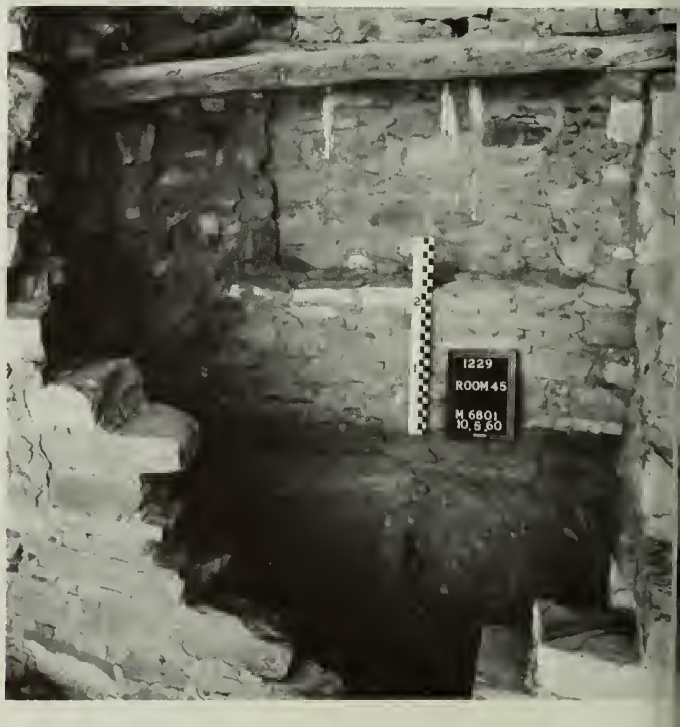
Niches

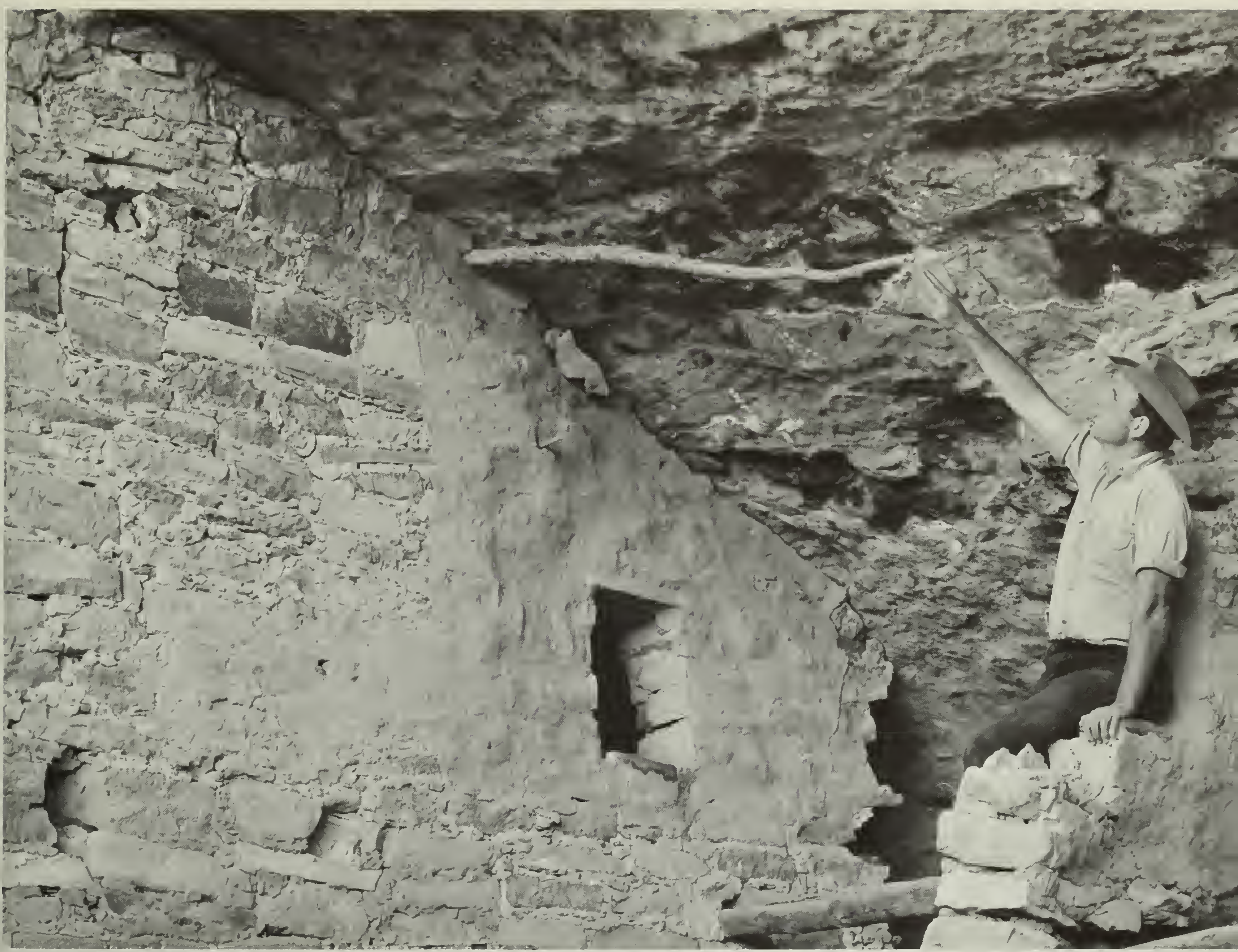
Nine rooms contained wall niches, two rooms having a pair each. Niches were formed by leaving a small gap in the interior wall masonry. Most average about 0.4 to 0.6 foot square and 0.3 to 0.6 foot deep, and they are situated at a convenient height, easily reached by persons sitting or kneeling on the floor. Two are roughly D-shaped with the straight side of the D at the bottom. The one in Room 36/2 is 1.4 feet wide, 0.8 foot high, 0.5 foot deep, and is recessed into a masonry wall. In Room 26, a depression 1.8 feet in width and height and 0.6 foot in depth was pecked out of the bedrock cave wall. Its sides and bottom were so rounded that a mud and spall shelf would be needed to retain anything in the niche. Nothing was found in these niches during excavation, but we may presume that small items, such as those found in kiva niches, were stored in them.

Shelves

Small shelves, probably comparable to niches in function, occur in seven rooms. They are simply slight offsets of the interior face of a masonry wall, usually about 0.2 to 0.4 foot deep and 1 to 2 feet long. Two of the three shelves in Room 37/2 and the one in Room 36/2 run the entire length of the wall, while two others in Rooms 6 and 37/2 are in corners. The one in Room 36/2 differs from the other eight in that the top of the masonry portion of the east wall, instead of being evenly faced to the cave roof as most walls were, was leveled off into a shelf. Two, and possibly three, of the rooms were used for storage, at least at some time.

Three rooms contained large shelves, running the length of one wall, with sufficient depth for a person to sit comfortably on them. In spite of their size, it is very unlikely that they were used for anything other than storage. Two shelves in Rooms 53/2 and 46/2 were formed by building a square lip of mud and spalls or sticks on a ledge of bedrock in the cave wall. The shelf in Room 45/1 (fig. 58) was built entirely of masonry, indicating its builder desired a feature of this kind.


58 Masonry shelf; Room 45/1.



59 *Suspension pole near ceiling, Room 42/2a.*

Suspension Poles

An interesting feature, rarely preserved in Southwestern sites, is the placement of poles near the ceiling of a room in such a way that various items could be suspended from them (fig. 59). In historic pueblos, the various roofing beams served secondarily as superior attachments for upright looms, the suspension of cradles, or most commonly as a storage rack from which to hang utensils and other items. The majority of rooms in Mug House had no such convenient devices since their builders had made use of the cave roof, so substitutes were often provided. Evidence of special suspension poles was found in four rooms, although collapsing walls may have destroyed signs of many others. Single poles were set into the wall tops just below the cave roof in Rooms 33 and 42/2; and the three beams at the top of Room 36/2 are more reasonably explained in this manner than as roof supports that would form a tiny third-story room about ½-foot high. One of the three timbers is set diagonally across one corner, in a manner unsuitable for roofing; it must have been intended as a suspension pole.

Room 73/1 contained shallow sockets for four poles that would have stretched midheight across the room. The poles would render the room uncomfortable for habitation, but would provide an ideal frame for draping long strips or strings of foodstuffs. I suspect that Room 73/1 resembled in both appearance and function an almost perfectly preserved room in Balcony House, on Chapin Mesa, in which six poles spanned the 6-foot width, 3 feet above the floor. Otherwise, the ceiling averaged 8½ feet high. In other respects, the Balcony House room resembles a dwelling, in its large size (6 by 10 feet) and the complete coat of plaster on the interior walls.

Three of the four rooms with suspension poles belong to the block of rooms around Courtyard B, and hence can be identified with a single social and/or kin group, although two of them were added to the original unit at a later date. Whether this indicates one group's

60 *Wall pegs; Room 17.*

preference for suspension poles, and the other's for wall pegs, as substitute hangers where roof timbers were not available, must be considered a possible interpretation. I suspect that better preservation at Mug House would have revealed more suspension poles.

Wall Pegs

Virtually every room whose walls stood near their original height, except the smaller storage spaces, contained wall pegs (fig. 60) or traces of such features. Thus, although 85 pegs and empty sockets were recorded from 26 rooms, it is likely that many more once existed. Wall pegs were normally near the ceiling (within a foot of it) and protruded 0.4 to 1.0 foot from the wall face. They seem to have been a primary means for hanging goods so they would be off the floor and out of the way. Serviceberry accounts for 29 of the 51 specimens that were identifiable. Other plants that saw repeated use were mountain-mahogany (5), oak (6), juniper (5), and willow (4). One specimen each of elderberry and greasewood were identified. Four of five wall pegs found loose in the rubble were serviceberry; the fifth was juniper.

Wall pegs appear to have been consistent features in dwelling rooms and most storerooms. They are also found in structures with nondomestic functions, where they probably served the same purpose. Wall pegs seem to occur most often either singly or in pairs, but six rooms had more than six of them. Room 14, a storeroom, contained 11.

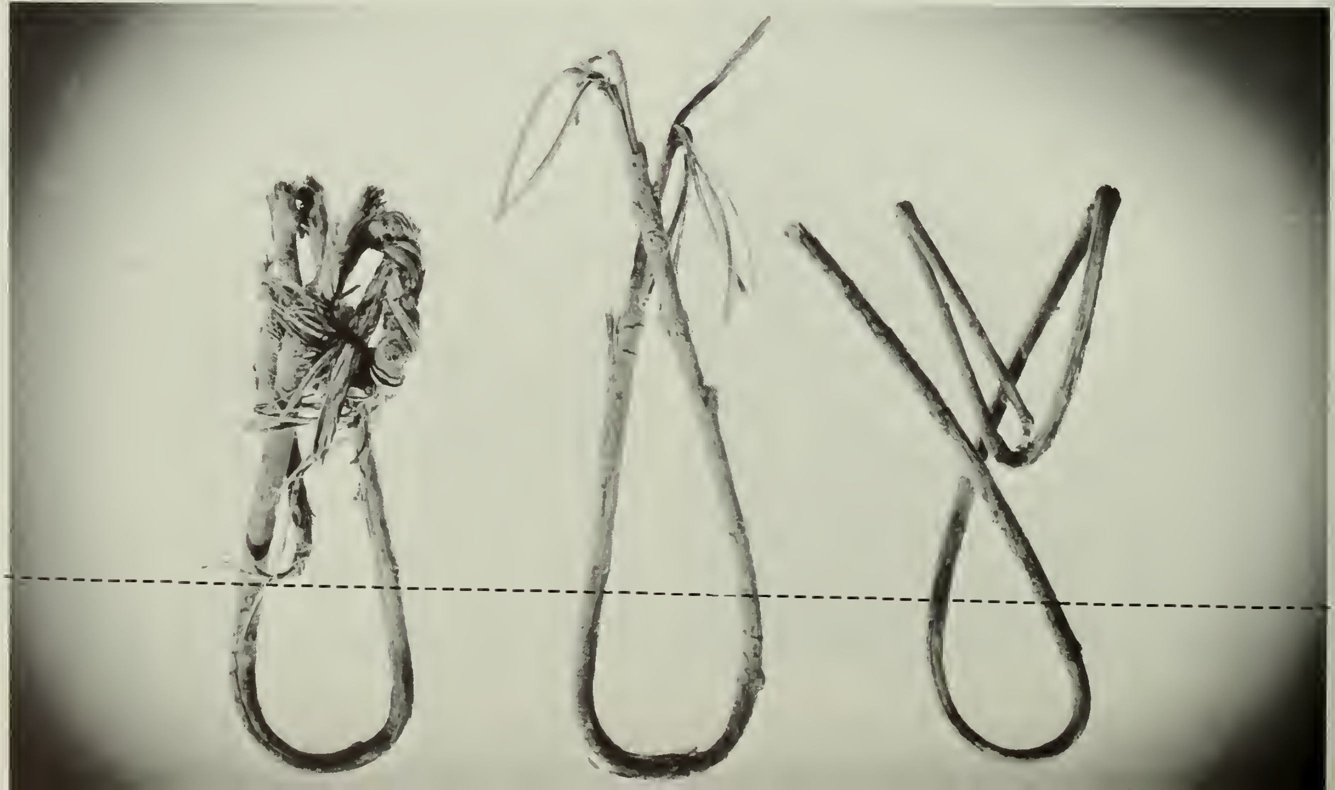
Wall Loops

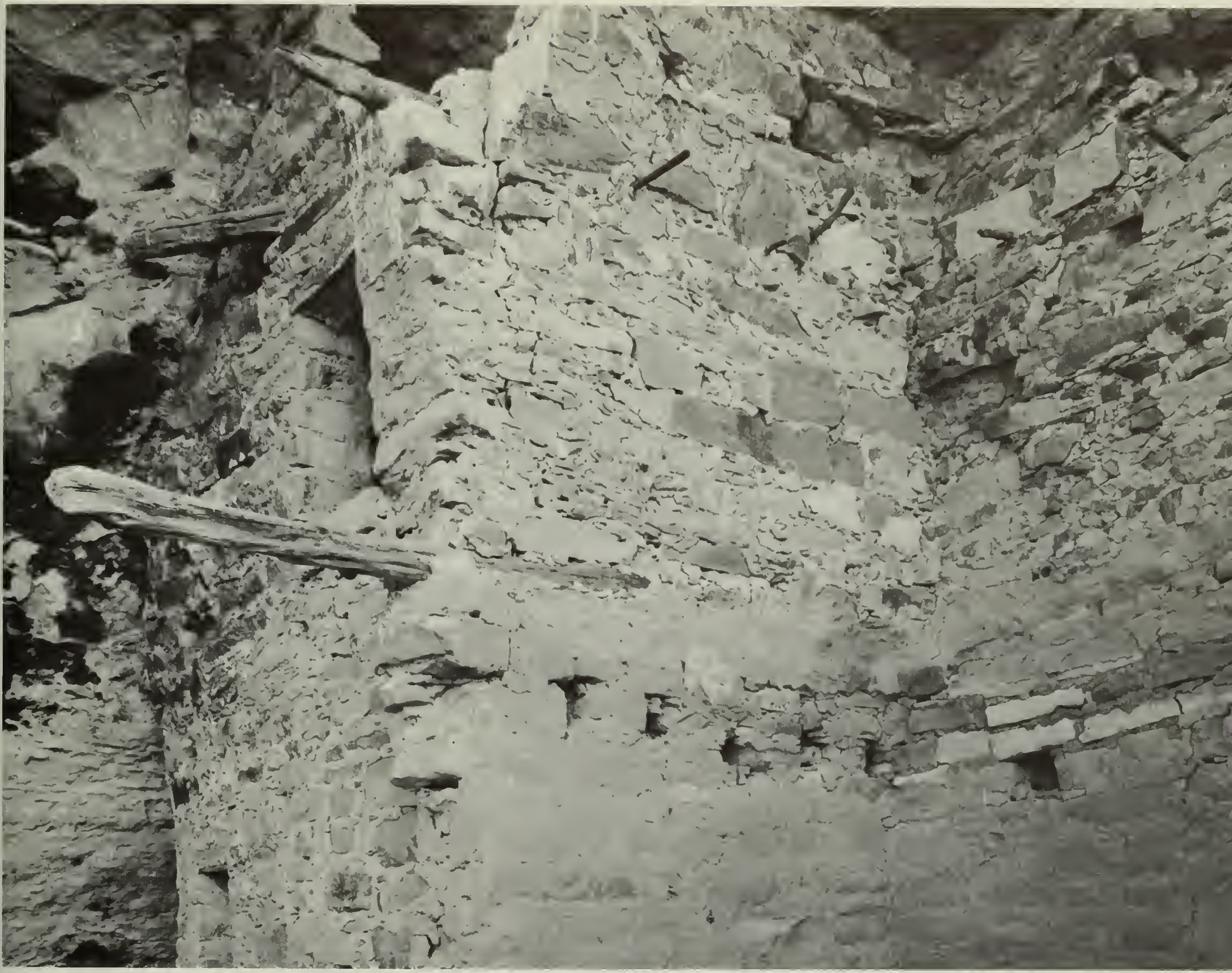
Three small loops of pliable oak twigs set into the north wall of Room 45/2 may have anchored the end of a belt loom. They are arranged in a triangle, with the apex toward the floor, 1.7 feet below. The two upper ones are 1.0 foot higher and 1.5 feet apart. A weaver sitting with his back against the opposite south wall would have had a minimum of 5 feet for the length of his loom, more than enough space for the average girdle-back loom. The openings enclosed by each loop are about 0.05 foot in diameter.

A larger loop of skunkbush in the exterior of Room 33's south wall was concealed by its incorporation in the west wall of Room 34. It stood 2.2 feet above the exterior courtyard level and enclosed a horizontal space 0.31 by 0.17 foot. Conceivably it may have helped tie the end of the newer wall to the smooth face of the older one, or it may have served as an anchor before becoming part of a masonry wall.

The means by which loops were anchored in the wall is best illustrated by three complete specimens found loose in the rubble (fig. 61). In each case, an oak twig was bent to form a loop in the middle, and the ends

61 *Three wall loops found in rubble.*





62 Possible balcony support timber projecting from common wall of Rooms 36/2 and 37/2.

were pulled together and sometimes tied with split yucca strips. The bulk thus formed and embedded in the wall made it impossible to pull the loop out without either breaking it or dislodging part of the masonry.

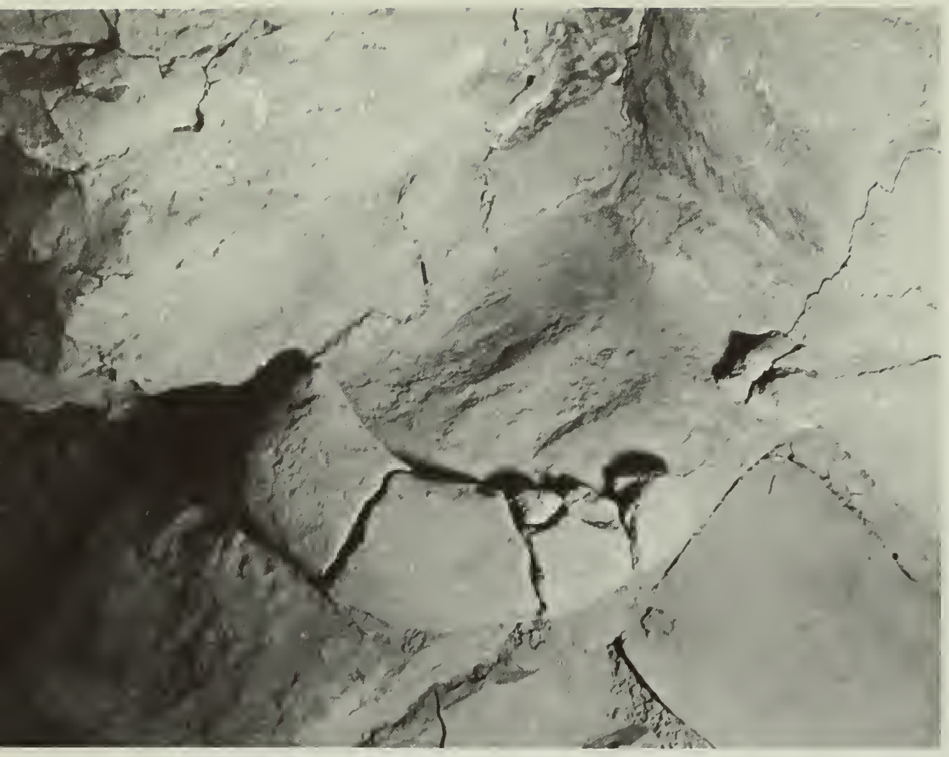
Balconies

Although no remnants of balconies could be positively identified, several probably once existed. One doorway to Room 36/2 and the now missing doorway of Room 37/2 would have opened onto empty space above Courtyard B unless there had once been a balcony there. The hard-to-explain timber projecting from the base of the common wall of the two rooms may thus represent the remnant of a balcony that extended across the north sides of both rooms (fig. 62). Other second-story rooms could have been entered more easily if balconies had been present. These include Rooms 22/2, 24/2, 69, 30/2, and 74/2.

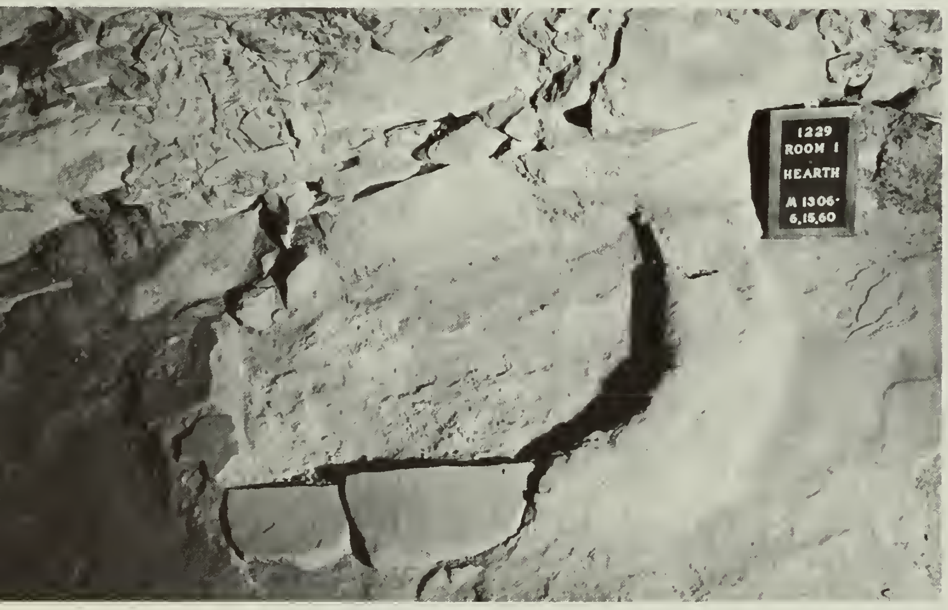
Hearths

Floor features are as difficult to verify as wall features because so many of the floors have been damaged or completely destroyed. Fortunately, features such as hearths left marks on some of the stone walls, where heat from fires oxidized the iron in the faces of building stones, changing their surface color to a bright red. With this clue, we can say that 25 rooms contained hearths, including at least 23 of the 40 rooms that probably functioned as dwellings. Undoubtedly many other rooms once had hearths, but these have been lost through ruination.

Some sort of hearth seems to have been a consistent occurrence in rooms most likely used for habitation, although several, including Rooms 12/1, 12/2, 30/2, 37/1, and 45/1, never contained them. No storerooms had them except Rooms 2, 7, and 21, where fires had burned *before* those spaces had been enclosed as rooms.



63 *Corner hearth; Room 47.*



64 *D-shaped hearth; Room 1.*

It is possible to distinguish a number of styles of construction and placement of these hearths. Rectangular pits, averaging 1.7 by 1.3 feet and lined with upright sandstone blocks or slabs, are found in corners in Rooms 22/1, 31, and 40/1, and in one corner of Courtyard C. A fifth one, which later held a storage jar, is associated with an earlier and slightly smaller manifestation of Room 71. The lips of all these hearths were flush with the floor surface and their bottoms were unlined.

All other fireplaces seem to have had at least a partially curved outline. There are 12 in room corners and 4 outdoor corner hearths in Area I and Courtyard C. Each forms essentially one quadrant of a circle, measuring from 1 to 1½ feet along the straight sides. Five others, built against the center of one wall, are D-shaped, with the straight side generally just over 2 feet long and a maximum width of about 1.3 feet. Many hearths of these two shapes rested on bedrock floors or the relatively thin roofs of lower story rooms, and thus had little or no depth. They were commonly bounded by low, rounded rims of adobe with sandstone spalls. Few of these rims are intact.

The best examples are in Room 47 (fig. 63; see also Nordenskiöld, 1893, pp. 35–36) and Room 1 (fig. 64). The large corner hearth in Room 66 may typify those in spaces where they could be excavated into subfloor fill: it is lined with upright sandstone slabs forming a crude pentagon about 2 feet across. Whether this is an attempt at roundness with straight-sided materials, or whether it was intended to be angular in the manner of the previously mentioned stone-lined hearths, is unclear from the damaged condition in which the feature was found. All other similarly located hearths were marked only by concentrations of ash where floors were broken.

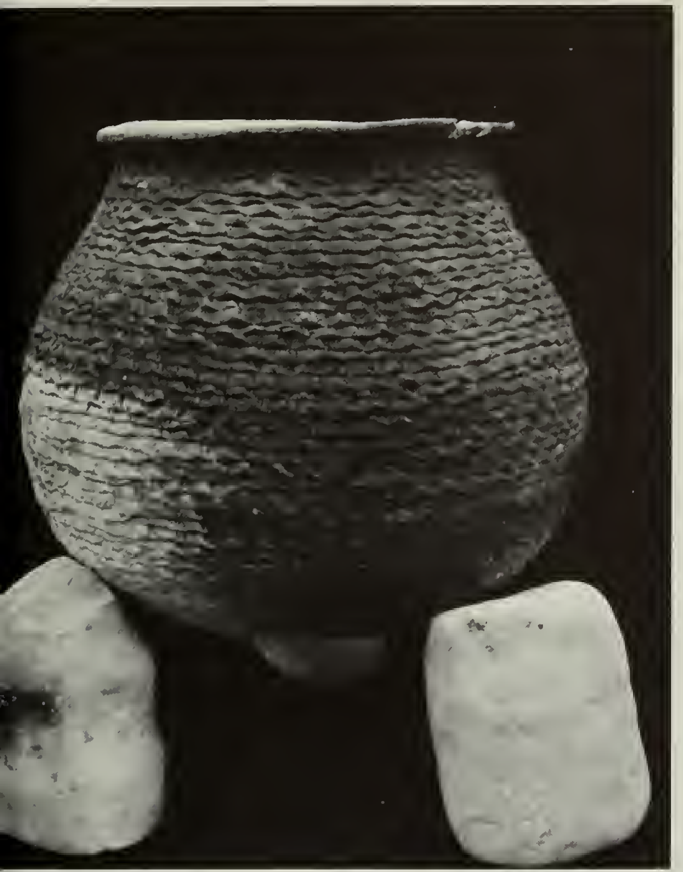
A circular hearth, 1.5 feet in diameter, with a raised adobe rim, occupies the center of Room 11/1's floor, a unique position in the domestic quarters of Mug House but common in structures with ceremonial associations. Could this placement mean that at one time Room 11/1 was designed to function as a kiva with a central hearth and a ventilator, including a vertical exterior shaft? If so, its ceremonial use was almost certainly discontinued at a later date, possibly when Room 11/2 was added and the ventilator was plugged.

Two oval hearths with packed dirt lining were located in more conventional spots. In Room 78, one was close to the walls in one corner, while another lay alongside the bedrock cave wall in Room 71. Both are shallow excavations into subfloor fill and have no raised rims.

I have already mentioned the evidence pointing to the former presence of fireplaces in once open areas currently enclosed as rooms. Actually, almost the entire cave roof on the upper ledge shows heavy smoke-blackening, even in places covered by room walls. Many fires must have burned in hearths now totally beyond recognition in roomlike Areas III, IV, and V, coating with soot both the cave ceiling and the bounding walls of neighboring rooms.

Pot Supports

Common occurrences in the hearths are fire-reddened concretions—supports for utensils, such as pottery vessels, and stone slabs used in cooking or heating various substances (fig. 65). All the pot supports are sandstone concretions, in a variety of shapes and deeply reddened by repeated exposure to fire. Most of them are complete concretions, but many had been broken at right angles to their long dimension before being used. Occasionally ends are smoothed by pecking. Those found in the hearths, as if they had only recently supported something, were in groups of three and imbedded in the ashes in a nearly upright position. Frequently, a fourth lay on the floor nearby, as if it were ready to use. Several hearths contained a small stack of up to six against one



65 Fire-reddened sandstone concretions found in hearths were probably used as pot supports, as shown.

side or on the rim, where they had apparently been stored.

Pot supports were found in large numbers throughout the trash and rubble fill of various rooms and kivas, but only 93 were assigned field catalog numbers. I would estimate that we encountered more than 200 complete specimens and many more fragments.

An interesting detail revealed by the pot supports is the Muguenos' exclusive choice of concretions for such use. Ordinary pieces of local sandstone undergo extensive fracturing when subjected to the intense heat of a direct flame. Concretions, on the other hand, almost never show fracturing as a direct result of use in the fire, and thus form the most practical locally available source for pot supports. In a sample of 45, sizes range from 4.4 by 3.4 by 8.8 cm. to 13.7 by 7.8 by 21.5 cm. Weights range from 236.5 gm. (8.3 oz.) to 3,006.1 gm. (6 lb. 10 oz.), with an average of 1,108.6 gm. (2 lb. 7 oz.).

Posthole

All ceilings or roofs rested directly on the wall tops and did not require supplementary support from posts set into the floor. The isolated posthole in Room 66 would seem to require some different interpretation. It apparently held the lower 0.5 foot of a pole 0.3 foot in diameter—hardly large enough to bolster roofing—set about 0.5 foot from the south wall. If its top were forked, a second pole could have been placed horizontally between it and the west wall, 3 feet away, thus passing directly over the corner hearth. Such an arrangement could have been useful in cooking.

Grinding Bins

Parts of 18 grinding bins came to light during the course of our work, but none could have been in use during the final occupation of Mug House. Those in Rooms 22/1, 42/1, and 53/1 had been sealed beneath smoothed clay floors, whereas those in Room 29/1 and Area VI had been torn up, filled with trash, and buried beneath a later living surface. Even though the side slabs were still present in the four bins of Courtyard F, their metates had been removed, and they were buried beneath about 2 feet of rich occupational refuse.

We can only guess as to how grinding bins were constructed because we found them in such poor condition. They were all apparently lined with large, shaped and dressed sandstone slabs not unlike some of the door slabs, if the only group of still-standing slabs in Courtyard F can be considered typical. The metate here, propped into a sloping position by stones and adobe, was surrounded by a smooth mud collar about 0.3 foot wide. At the lower end, the basin in which ground meal was collected had a rectangular shape with rounded corners and was usually floored with small, shaped sandstone slabs, often including a well-worn mano. Parts of this basin, the mud collar, and impressions where the large stone slabs stood constitute the sole remains of 14 bins.

The arrangement of six groups of grinding bins prompts additional speculation. One group of six bins in Room 29/1 seems to have no specific orientation, and appears to be the only group built and used within the confines of a room. Three bins in Room 22/1, two in Room 42/1, and a single one in Room 53/1 were probably used when these spaces still belonged to outdoor courtyards or work areas. Subsequent construction of the rooms caused their destruction. Two bins are located in a corner of Area VI and four in Courtyard F, next to Room 76. It is obvious that no pattern of coarse, medium, and fine grinders can be claimed for Mug House.

The fragmentary condition of all these grinding bins raises a most intriguing question: did the last grinders of corn dispense with having the metate fixed in a bin as their ancestors had done, or is our evidence simply deficient? Of course, there is a remote possibility that the final inhabitants did not grind corn or other plant foods into meal, but this conjecture insists on greater changes in cultural pattern than the suggestion that metates were simply propped on loose stones, rather than set into bins. However, any new grinding bins built to replace those razed during new room construction would probably be placed in an outdoor work area where some shelter from wind and rain would be afforded. Would it be too great a stretch of the imagination to suggest that the bins used by the last inhabitants of Mug House may have been situated in the courtyard spaces formed by the roofs of kivas and were totally destroyed when these roofs collapsed?

Storage Jars

Corrugated jars were frequently buried beneath room floors, with their orifice at or near floor level. We uncovered 17 vessels and the pits where 2 others probably once rested. All of the vessels belong to the late Pueblo III Mesa Verde Corrugated and are discussed in chapter 8. Two were found in storage Room 79 and two in kivas, but all others had been placed in locations where living, cooking, or other domestic activities took place (fig. 23). Stone covers, some shaped, others unshaped, closed the mouths of those that were found intact, but many of the jars had been damaged or disturbed too greatly to determine if covers had been present.

Presumably these jars were used for storage, and took the place of storage cists found in other sites but absent at Mug House. Only four jars contained anything.

A medium-sized jar in Area V contained a double handful of squash seeds, most likely saved for planting, since they would hardly make an adequate meal for a family. This jar rested on a doughnut-shaped yucca pot rest and was surrounded by the remains of a yucca strip net. Its mouth was sealed by a large sandstone slab fragment and mud. There is little or no chance that any of the contents were lost over the past 700 years.

A small jar, beneath the floor of Room 30, held some fine dust and numerous elytra of Tenebrionid beetles belonging to the genus *Platydema* (identified by Samuel A. Graham). Most insects of this group feed on materials such as meal or seeds, either of which may have been sealed into this pot with a stone jar lid and covered by the floor. No traces of such food remained in the jar, but cornmeal not eaten by insects would probably decay with the help of metabolic water from the beetles. A yucca strip had been tied around the neck of the jar.

A large jar was completely filled with waterborne sediments containing the skeletons of an estimated 100 or more shrews (see p. 103). At least 33 individuals are represented from over 300 bones carefully picked out of about one-third of the jar's fill. Another large jar contained a bone awl and 121 unworked mammal and bird bones (see p. 104). Both jars were set beneath the floor of Room 71, side by side.

ADDITIONAL ROOM NOTES

Rooms 3 and 4

These two spaces do not readily fit with either the living rooms or the storerooms. But, in their relationship to Rooms 1 and 2, they may have provided a combination of sleeping space for children and limited storage. Possible support for this suggestion comes from a small step cut into the wall exterior of Room 4, a little over halfway from the floor to the doorsill. A child would need to place his toe on this step to climb through the small opening. It would be easier for an adult to bypass the step and put his foot directly through the opening.

Room 8

The space designated as Room 8 had a varied history. The earliest enclosure of the space included both Rooms 7 and 8 in a possible living room, with a hearth in the north end. Somewhat later, two storage rooms were created by a wall and the hearth was removed. Room 8 was then turned into a passageway between Area III and the roof of Room 9 by the removal of part of its south wall and the partial filling of the space to the topmost level in Area III.

Room 29/1

The remains of six grinding bins in Room 29/1 indicate its use at one time as a workroom. Arrangement of the bins seems to conform to the outlines of the room, indicating the walls were probably built before the bins were set up. The tunnel opening leading to Kiva B may also have been in operation at this time or slightly later. Following its initial service as a workroom, Room 29/1 was remodeled into a habitation and ultimately became a dumping place for rubbish.

Room 46/1

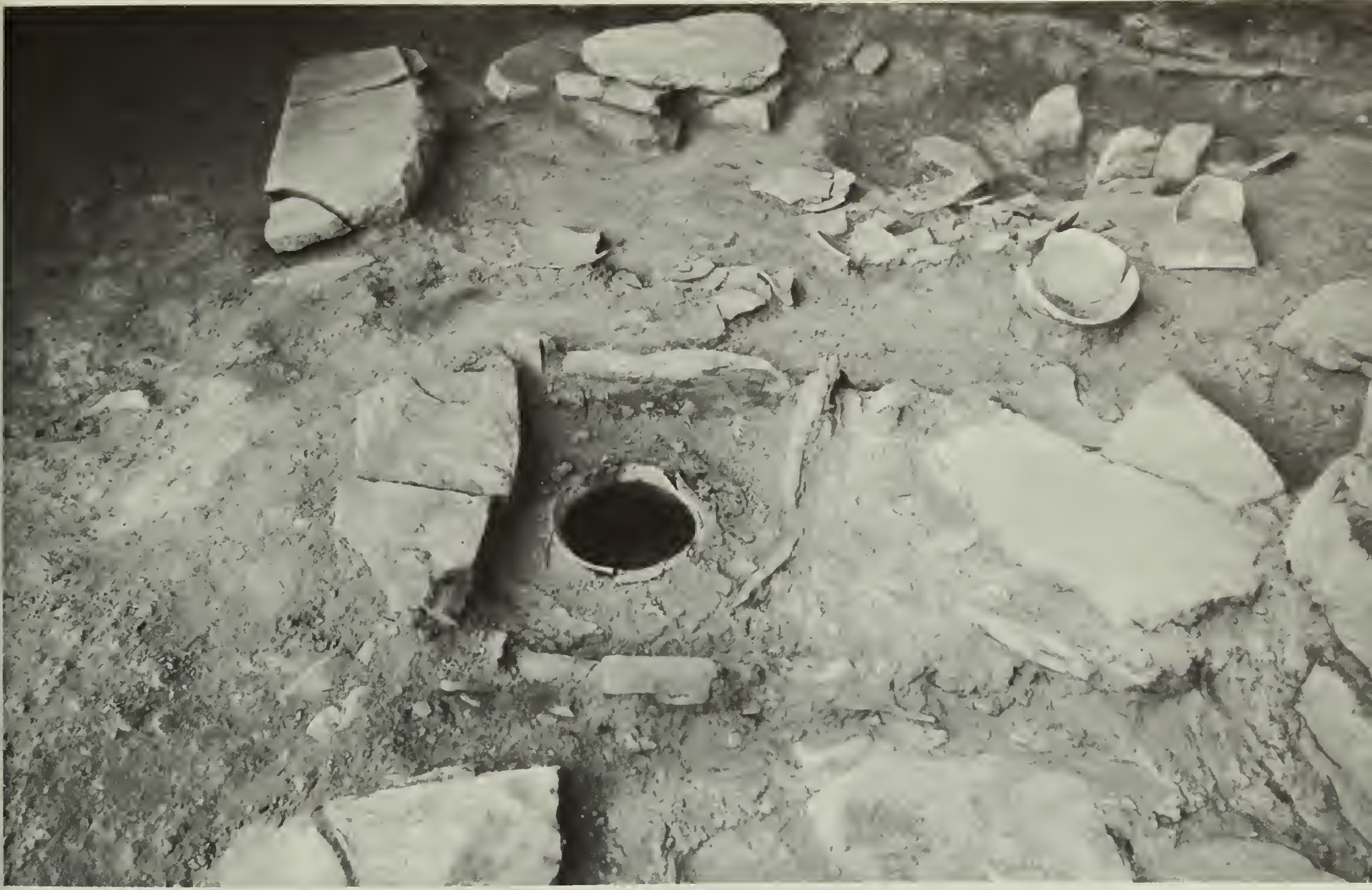
I have already mentioned the unusual size of Room 46/1 and the probable correlation of this with its function as a turkey pen. Most of the room had been dug out prior to our work in 1960 and the backdirt was still evident just outside the walls. Both the remaining fill in the room and in the backdirt heap consisted largely of masses of consolidated turkey droppings containing some obvious garbage—corncobs and other vegetal remains—and relatively large quantities of turkey gizzard stones. These were the only spots in the entire ruin where matted turkey dung was recovered, although individual droppings turned up in many other spaces.

Room 54

Detached Room 54, built under a large sandstone boulder part way down the trash slope, may have been originally designed as a storeroom. But when excavated, it was completely concealed by trash and contained the remains of two burials (M12 and M13). One of the burials had been greatly disturbed in prehistoric times.

Room 71

Perhaps the most interesting domestic space of all is Room 71. The presence of a hearth, stone table, two storage jars set beneath the floor, and several pottery vessels and other items resting on the floor (fig. 66) suggests that the important chores of meal preparation were carried on in this room, apart from the other living rooms belonging to the same room cluster. The stone table is an ovoid tabular piece of sandstone, with a flat, pecked, and ground upper surface, resting on three smaller pieces of sandstone and standing a total height of 0.35 foot above the floor level. The top measures 0.8 by 1.3 feet. It is located next to the cave wall and adjacent to the hearth. Although this is the only *in situ* example of a stone slab used as a table, the many similar stone slabs found in the general fill suggest that other features of this sort may have been used in other work and living areas. A long, narrow sandstone block with a naturally flat and smooth top surface was mudded to the floor at right angles to this table and could easily have served the same purpose. It stood at the same height above floor.



66 *Various in-place items in Room 71.*

AREAS

The six irregular outdoor living and work spaces on the upper ledge were designated Areas I through VI. Area numbers VII and VIII have been dropped since these spaces turned out to be parts of Courtyards F and H, respectively. The various subdivisions of the trash slope were designated Areas IX through XVIII, for convenience in referring to them and not because they are supposed to represent living or storage quarters.

Area I provided excellent covered living space, with a hearth in one corner, for the members of Suite 1, while Area II gave access to several household units and to the rest of the community. The floor for both of these spaces was the bedrock sandstone ledge.

Area VI seems to have been the focal point of activity for Suite 19, and contained one storage jar and remnants of two grinding bins. The uneven bedrock floor was gradually leveled by the accumulation of refuse behind a low retaining wall along the lip of the ledge. Several compacted layers, probably representing walking surfaces, were discerned as we dug through the debris, and a stratigraphic sequence of pottery was recorded from the various levels. The lower two levels (III and IV) appear to belong to the earliest component in Mug House cave, and may be part of a pocket of trash not cleaned out by the later builders. The storage jar (fig. 166a) was embedded in the ground which formed the walking surface of Level III (fig. 67).

The story of development of the space encompassed in Areas III, IV, and V differs from that of Area VI in its early stages. Construction of Rooms 10, 11, 12, and 15 on the upper ledge roughly outlined a large area for which the bedrock sandstone ledge served as a floor. This area was then enclosed on one end by a wall containing a large T-shaped doorway. Fires burned there periodically, as indicated by reddened patches and ash lenses on the bedrock, but no specific hearths were formed in any one spot. Subsequently, the area was filled with refuse and debris up to 4 feet deep, and it was reduced in size by the building of several more rooms.

The Muguenos apparently brought in the lowest levels of fill, possibly from some kiva excavation, and raised the floor level intentionally (the dark color and ashy nature of typical refuse are missing in these deposits). The reasons could involve a simple desire for fresh flooring, the building of a layer of fill in which to set storage jars (two were set in at this level), or an attempt to make the space easier to heat and keep warm. The bare bedrock remains chilly during cold weather, even though the air within the space is warm. Additional fill accumulated as the users of the space dumped refuse there and even defecated in the corners.

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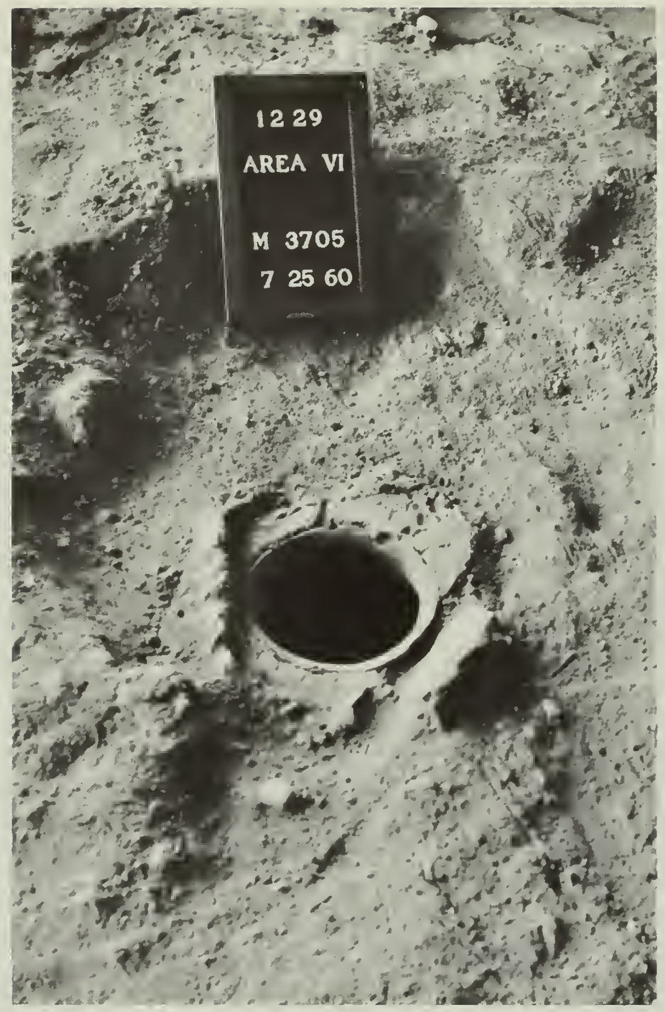


67 Mud collar around storage jar set in walking surface of Area VI.

As the deposit grew, it was packed down into a number of recognizable surfaces, which often correlated with the building of new rooms, and the available headroom decreased. Once the filling began, it became impossible for an adult to stand upright in the main parts. Numerous ash and charcoal lenses throughout the refuse layers show that fires burned often, if not constantly, adding to the heavy soot layer on the cave roof and on the walls of adjacent rooms. The rising trash spilled through the large T-doorway into Area VI, reducing that passage to a small rectangular opening, through which it was necessary to crawl on hands and knees.

Areas III through V closely resemble rooms, except for their size and shape. They are almost completely enclosed; fires were kindled there; the packed dirt walking surfaces were equal to some room floors; and two storage jars were set beneath one of the walking surfaces. Area V even had two wall pegs.

COURTYARDS

Courtyards, which by definition include the tops of kiva roofs, are poorly preserved, owing to the collapse of all kiva roofs and their upper liner walls. At least two courtyards (C and E) contained hearths, but probably all did at one time. Buried corrugated jars were found in Courtyards A, B, and C, and may also have been consistent features, since restorable jars were found in the fill of all kivas. Grinding bins were preserved only in one corner of Courtyard F, but the absence of intact bins could be due to their destruction caused by the collapse of kiva roofs.

OTHER FEATURES

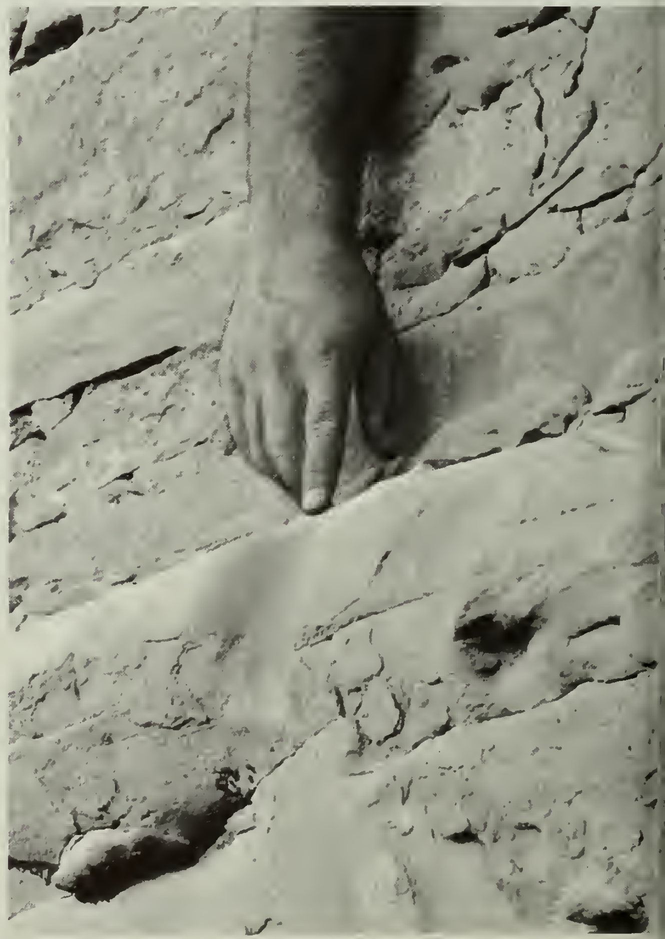
Ladder Grooves

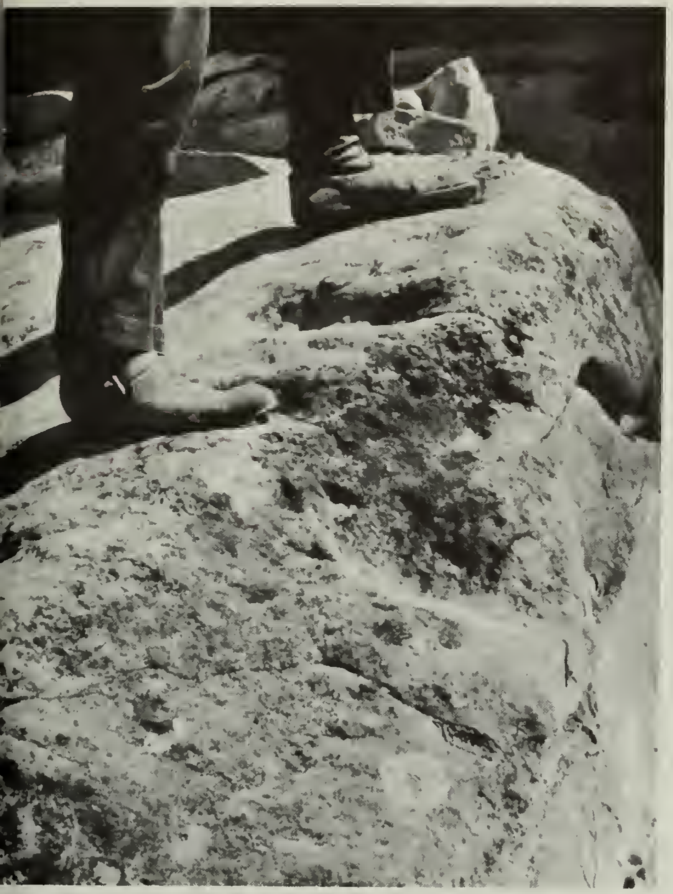
Access to the upper ledge was apparently achieved by ladders leading from the roofs of houses in the lower cave. Grooves made by ladders may be seen on the front edge of the sandstone ledge between Rooms 12 and 15, and directly above Room 29 leading into Area VI. The former route was obstructed by the building of storage Room 57 in the old passageway between Rooms 12 and 15. The latter route became obsolete when the roof of Room 29/2 was built within a foot of the level in Area VI. A third group of ladder grooves at the corner of Room 15 and Area VI (fig. 68) does not fit into the traffic pattern of Mug House as we know it, and may represent a ladder route used during the early occupation. Although no ladders were found, we can assume from the grooves that they consisted of two vertical poles with crosspieces or rungs.

Hand Loops

Anyone wishing to traverse the 1-foot-wide ledge in front of Rooms 10, 11, 12, and 15 was assisted by a series of wooden loops set into the exterior wall faces. Traces of 14 loops and one empty socket can still be seen along the 45-foot stretch of wall and there once may have

68 Ladder grooves in face of upper ledge.





69 Steps pecked in sandstone boulder near south tower (Room 76).

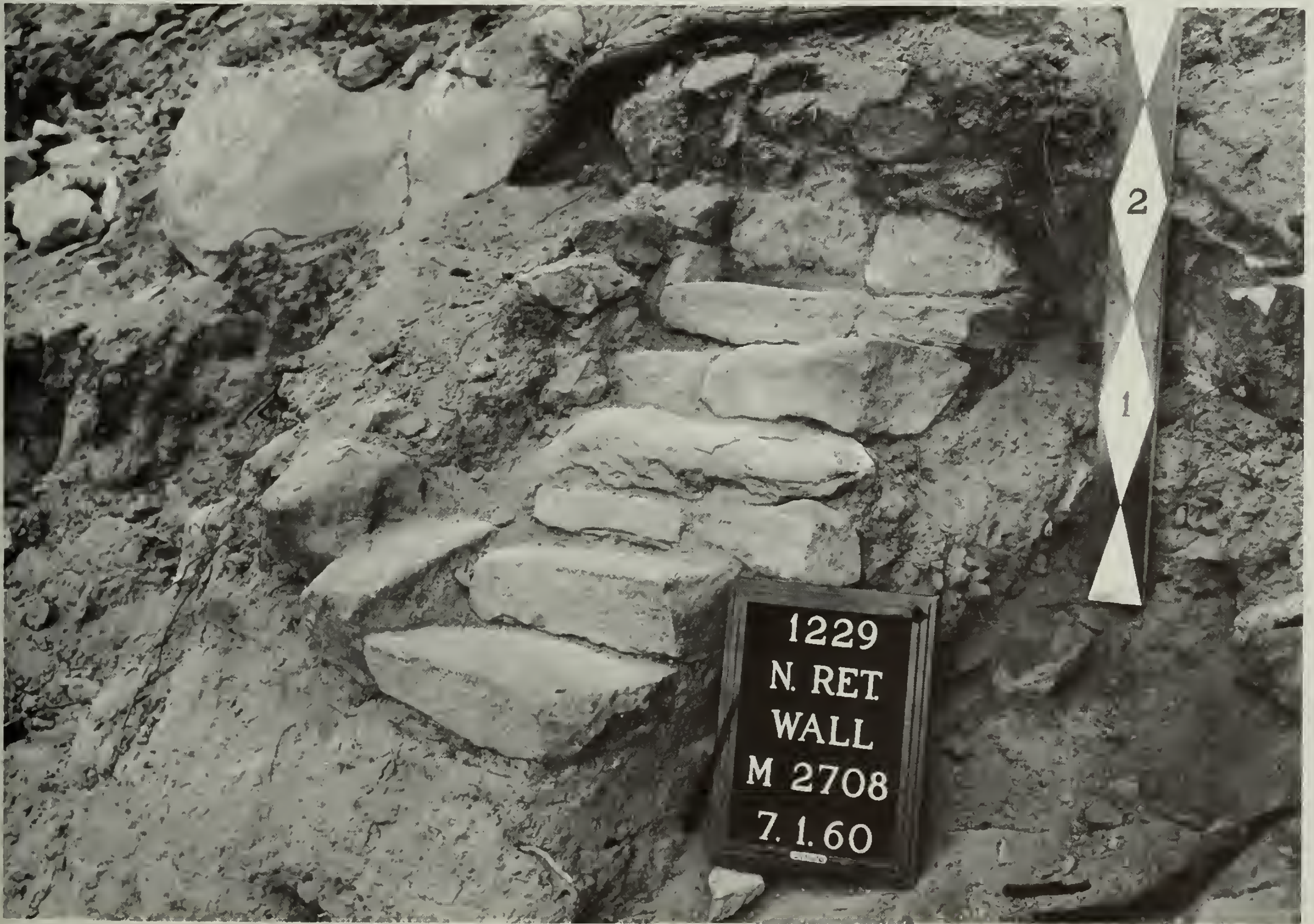
been two or three others. They are generally set from 2 to 3 feet apart and 4 to 4½ feet above the ledge. The five loops built into Room 15's wall are made from skunkbush, but nine others built into Rooms 10, 11, and 12 are oak. It is hard to imagine why anyone would want to walk along this very narrow ledge instead of through the spaces behind the rooms. However, the loops do not seem to have been intended for adornment. If the occupants of these houses needed to stand on this ledge while repairing their dwellings, the loops would have provided a firm handhold, thus freeing one hand for work.

Steps

Steps were employed in only three places, none of them really necessary. Two small, pecked steps provided somewhat firmer footing for persons stepping off the tops of ladders onto the upper ledge. A set of four pecked steps provided a trail up the sloping surface of a sandstone boulder to the terrace level alongside the south tower, Room 76, and may have formed part of the trail from the south (fig. 69).

Another set of stairs was carefully fashioned of stone masonry much as modern Americans would build (fig. 70). Five stone steps, 1.6 feet wide, with average treads of 0.6 foot and risers of 0.4 foot, at one time led down onto the trash slope from the terrace alongside the north part of the lower buildings. Crude stone balustrades flanked the steps on both sides. They do not seem to have

70 Stone masonry steps leading to trash slope in north part of Mug House. Stones forming balustrade to right of steps were accidentally removed before the steps were discovered.



been in use for a very long time, since they were completely submerged by the uppermost level of occupational refuse.

Retaining Walls

As Mug House grew in size, level ground on which to build had to be provided artificially. Two long retaining walls produced a nearly level terrace along the entire west side of the lower cave, and prevented loose fill beneath the front rooms from bleeding slowly downslope. These two walls represent the latest construction for retaining fill, as traces of earlier walls with a similar purpose were encountered around Kivas C and D, beneath Rooms 60 and 66, and behind the long south mound retaining wall. The fill held by these walls probably came from excavations in which kivas were to be built and from the steady accumulation of trash.

There is evidence also of a major leveling project in the south end of the lower cave. An old line of fill can be traced along the back of the cave behind Rooms 72, 46, 47, 48, 49, and 53, sometimes reaching a height of about 5 feet above the present floor levels. The mass of fill removed from this part of the cave probably helped to level the open end of the shelter and to provide sufficient depth for kivas.

Sharpening Grooves

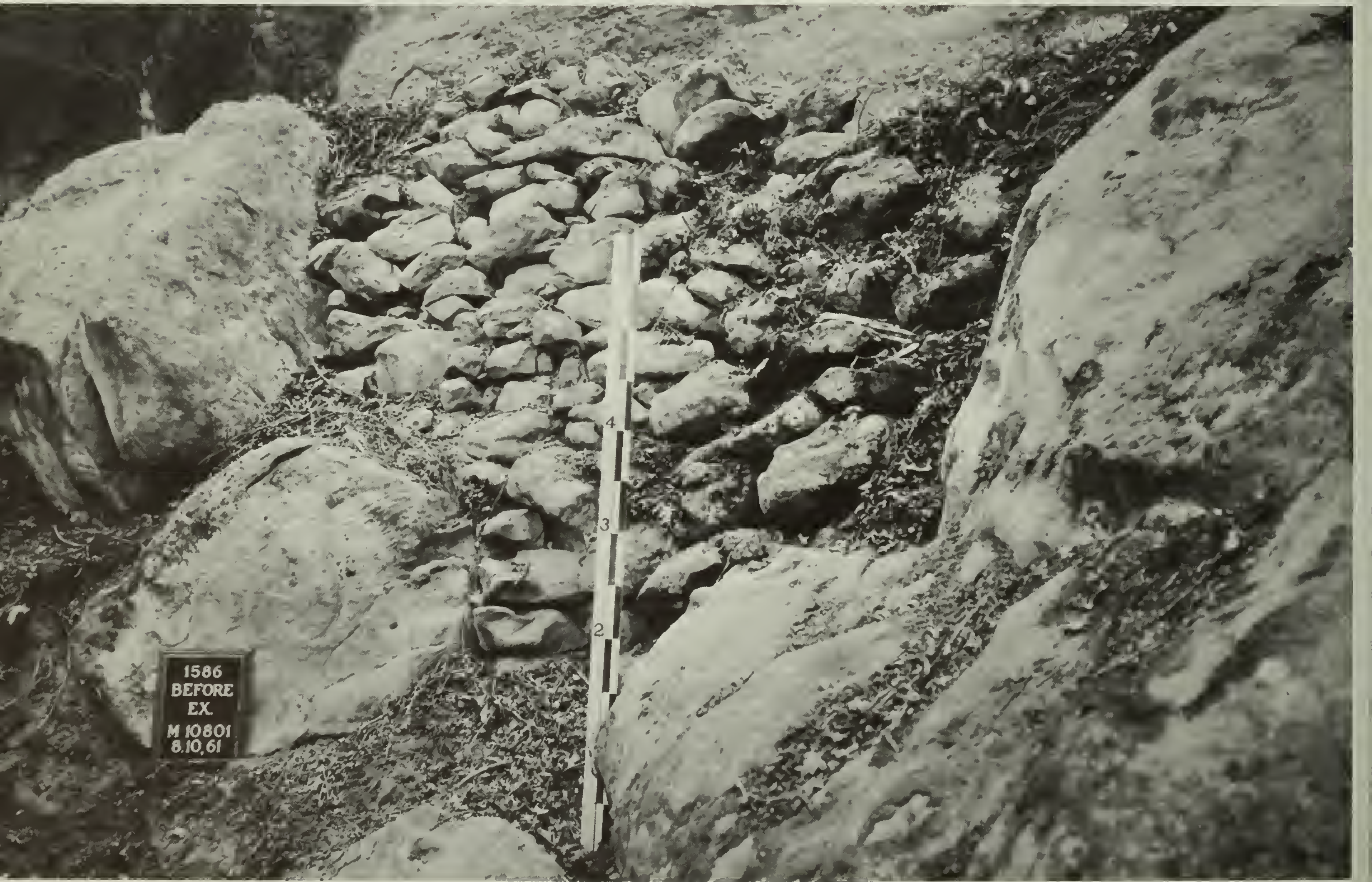
Ax-sharpening grooves were noted in four places in Mug House. The sandstone ledges, upon which Rooms 25 and 19 and the passageway leading to Room 42/1 were built, bear several such grooves. The largest number was found on a sandstone boulder in the upper end of the trash slope below the south tower (Room 76). Very likely there were others, since concealed by wall construction or buried in the trash slope. Awl-sharpening grooves were found only in the cliff wall at the north end of the lower cave.

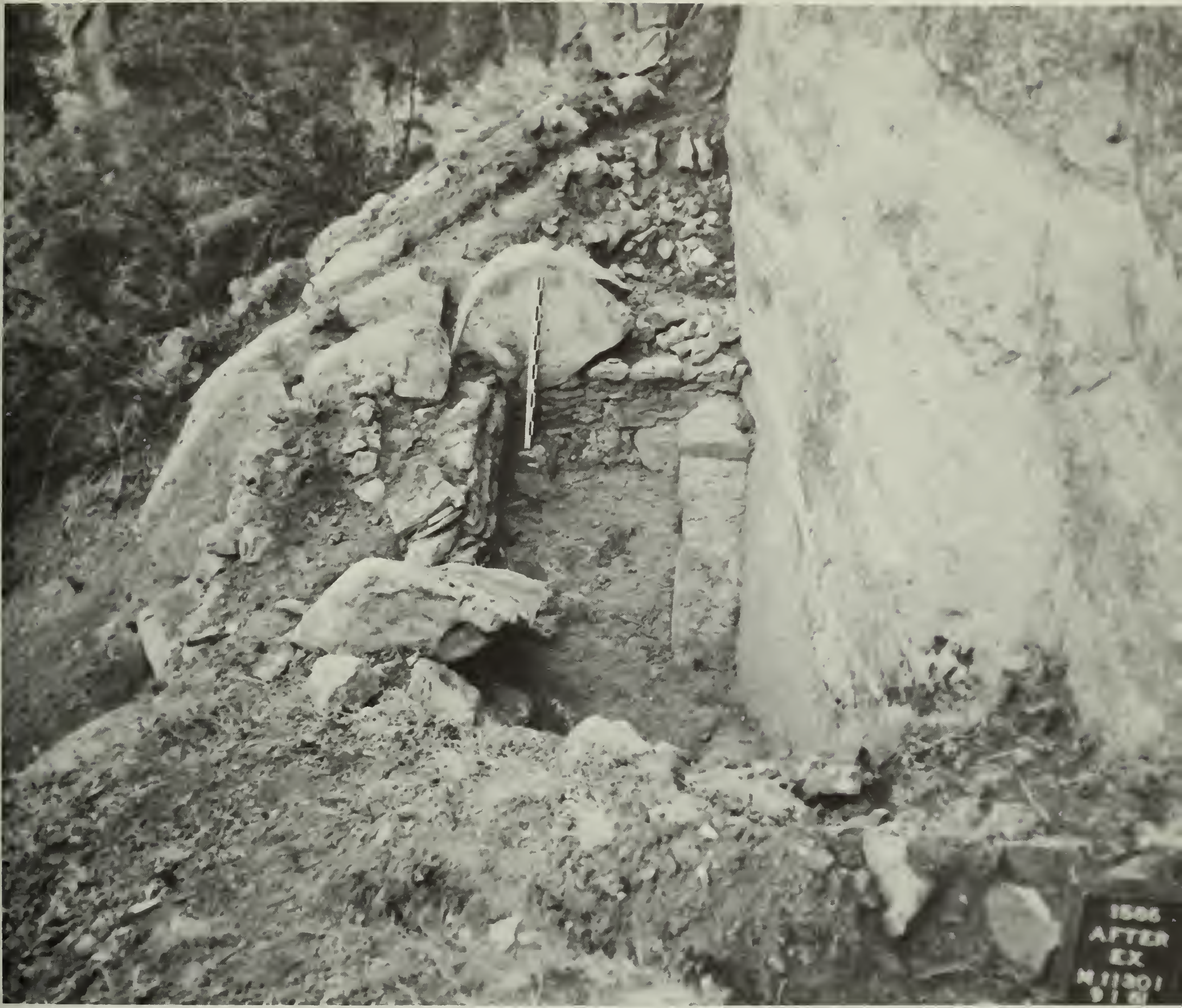
MUG HOUSE RESERVOIR (SITE 1586)

About 200 yards south of Mug House, at the juncture of the talus slope and the base of a nearly vertical sandstone cliff, is a reservoir (Site 1586), first discovered by J. A. Lancaster in 1935. We excavated and stabilized it in 1961.

The Indians had dug away the top part of the talus against the cliff and formed a basin by building a 10-foot-high rock and rubble dam across the front (fig. 71). They lined the inside with coursed masonry in which smooth-faced stones were set close together in reddish-brown mortar without chinking. A layer of the same kind of mud covered the bottom.

71 Stone wall of dam, Mug House reservoir (Site 1586).





72 Mug House reservoir, after excavation.

The dam measures about 7 feet thick at the top. Originally it was only about 4 feet thick and was supported on both sides by rough stone walls sloping inward 1 foot in every 3. The inner wall stood 4½ feet high and was buried by the construction of the later liner. The outer wall currently stands 9 feet high. The stones in it were not shaped and were roughly stacked together. The reservoir measures about 22 feet long by 10 feet wide by about 4 feet deep, and holds between 6,000 to 7,000 gallons (fig. 72).

Runoff water from approximately 6 acres of mesa top spills over the cliff directly above it. A relatively light shower usually fills the "tank," but the incoming water carries a great deal of mud. Presumably the Indians constantly needed to dredge the reservoir, since we found it entirely filled with sediments that had begun the slow process of soil formation.

A pocket in the adjacent cliff sheltered a cache of adobe identical to that lining the reservoir's interior. This material may have been kept handy in case quick repairs became necessary.

The trail leading south from Mug House along the base of the cliff passes by the reservoir, then ascends a talus fan to the mesa top about 30 yards farther south. Near the point where this route reaches the mesa top is a large pile of rough sandstone blocks that can hardly be a natural accumulation. They are heavily weathered and covered with lichens, indicating that they have rested there a long time. This would appear to have been a stockpile of future building materials, awaiting transportation to the building site.

CHAPTER 4

architecture: kivas and towers

The identification of a structure as primarily ceremonial rests on the work of earlier students of the Southwest who saw the resemblance between prehistoric and historic Pueblo kivas. These are specially constructed, subsurface chambers in which religious rituals take place and where leisure time may be spent by members of the kiva societies. In modern Pueblo society, religious activity and kiva membership and use generally revolve about the men, and women play a secondary role. Usually, male activities tend to be associated with the kivas while female activities center around the dwellings proper.

Mug House contains eight kivas and three other structures that appear to be ceremonial in character. Room 9 has several details found only in kivas and probably represents a "kihu"—a room built among the secular rooms but used as a ceremonial chamber (Fewkes, 1911b, p. 15). The two towers, one at each end of the ruin, appear to be associated with the kivas.

KIVAS

Many features and construction details are shared by all or most of the kivas. Consequently, features in common are treated first in the following discussion; then each kiva is discussed as a separate entity, with particular attention being paid to any unusual or special characteristics that are evident.

Size and Shape

In their final state, the floor plans of all eight kivas are essentially circular, with diameters ranging from 11 to 13 feet. The two earliest kivas, B and D, have the smallest diameters. All later kivas are 12 feet or more in diameter.

Although seven of the eight were originally built on a circular plan, Kiva F started out as a crude square about 12 feet on each side. It had all the usual features of a kiva except the circular shape. Apparently the kiva members changed their minds about this peculiarity, because they subsequently built a circular liner wall around the lower half of the kiva but did not alter the upper half.

The original square shape was in no way influenced by location. Its builders could have just as easily given it the more customary circular shape. Although the shape is unusual, a number of other square or rectangular kivas are known at Mesa Verde. To be sure, some, like that at Inaccessible House on Chapin Mesa, were influenced by the shape of the space in which they were built. Kiva F in Mug House indicates that space limitations do not satisfactorily explain the construction of all square kivas.

Unlike the rooms, the kivas had plenty of head space. A man of average stature could stand upright in any one of them without bumping his head, and even a tall man would not be forced to stoop in most of them.

One of the features consistently attributed to the typical Pueblo III Mesa Verde kiva is the presence of a relatively deep recess at banquette level on the south or southeast side. Such a recess often gives a keyhole appearance to the ground plan. In the caves, few of which faced directly to the south, the position of the recess was modified so that it pointed toward the opening of the shelter. In this respect, the Mug House kivas were no exception. The six most typical ones have recesses, four of them on the west side toward the opening of the shelter. Kivas A and G, which lie partly outside the sheltering overhang, have recesses on the south side. Although Kivas E and F do not have recesses, the banquettes on their west sides above the ventilator shafts are somewhat deeper than elsewhere.

The purpose of the recess is uncertain. Some archeologists consider it to be an altar; others, a place to stack firewood; and still others, a place for visitors to observe some of the rituals. The kivas in Mug House do not shed any light upon the problem, although a few observations may be noted.

Apparently a recess is not indispensable to the functioning of a kiva, as Kiva E and numerous other kivas in contemporaneous sites definitely lack one. In Kiva C, a tunnel leading in from the courtyard opens directly into the recess, which then had to be crossed before the entrant could reach the kiva proper. A niche was found in the walls of the recess in Kivas A and B. Thus recesses appear to have served different purposes in different kivas and were even unnecessary in some.

Masonry

Since the kivas were built in holes dug into the floor of the rock shelter, only the interior face of the masonry lining wall would be visible. Dirt and rubbish would be filled in against the exterior face. Accordingly, the lining masonry was constructed one stone thick, and the masons exercised considerable care in alining the smooth, stone surfaces to form the interior wall face. The exterior was left ragged. Smaller blocks of sandstone were used in the kivas than in the rooms, and the majority of their visible faces were dressed by pecking. Naturally flat stone faces and some evenly spalled ones were consistently used, but grinding as a dressing technique was found on only a few stones in Kiva B. The lining wall almost always sloped inward toward the top.

The better masonry and the smaller stones always occur in the lower half of the kiva walls, below the level of the banquette. Above the banquette, the stones were larger, fewer had been either shaped or dressed, and their faces were less carefully alined. In Kivas G and H, parts of the lowest course of the upper liner wall were formed by thin, upright sandstone slabs that would form a very weak base if any weight were placed upon them. Fortunately, the tightly packed fill around the wall exteriors absorbed much of the weight imposed on the walls by the roof.

In general, the same kinds of mortar used in building domestic rooms were used in kiva masonry. Only the reddish-brown loess material from the mesa top is absent. Varying shades of brown, tan, and buff mortar, some of which probably came from the deposit in Adobe Cave, were used in Kivas A, C, D, E, and H. The pulverized blue-gray shale held stones together in Kiva F, and both the brown mud and pulverized shale were employed in different parts of Kiva G. Seams between building blocks were much tighter than in any of the secular masonry. None of the kivas contained chinking in the masonry seams. This lack of chinking contrasts so sharply with domestic masonry that it would appear to be a significant attribute of ceremonial architecture in Mug House.

Banquettes

The vertical offset between upper and lower lining walls in each kiva produced a shelf, or banquette. The topmost course of stones in the lower lining wall formed both the front edge and part of the floor of the banquette, the remainder being filled in with packed earth and adobe. The average banquette is a little over 1 foot deep, but extremes of ½ foot to about 2 feet were encountered. The recess previously mentioned could be regarded as an unusually deep part of a banquette. In general, banquettes might be considered shallow recesses between the pilasters. In six of the seven circular kivas, the banquettes stand from 3.1 to 3.6 feet above the floor level. The Kiva G banquette is 2.7 to 2.8 feet above the floor. In the original square Kiva F the banquette height was only 2.6 feet, and this level was maintained in the subsequent remodeling to a circular floor plan.

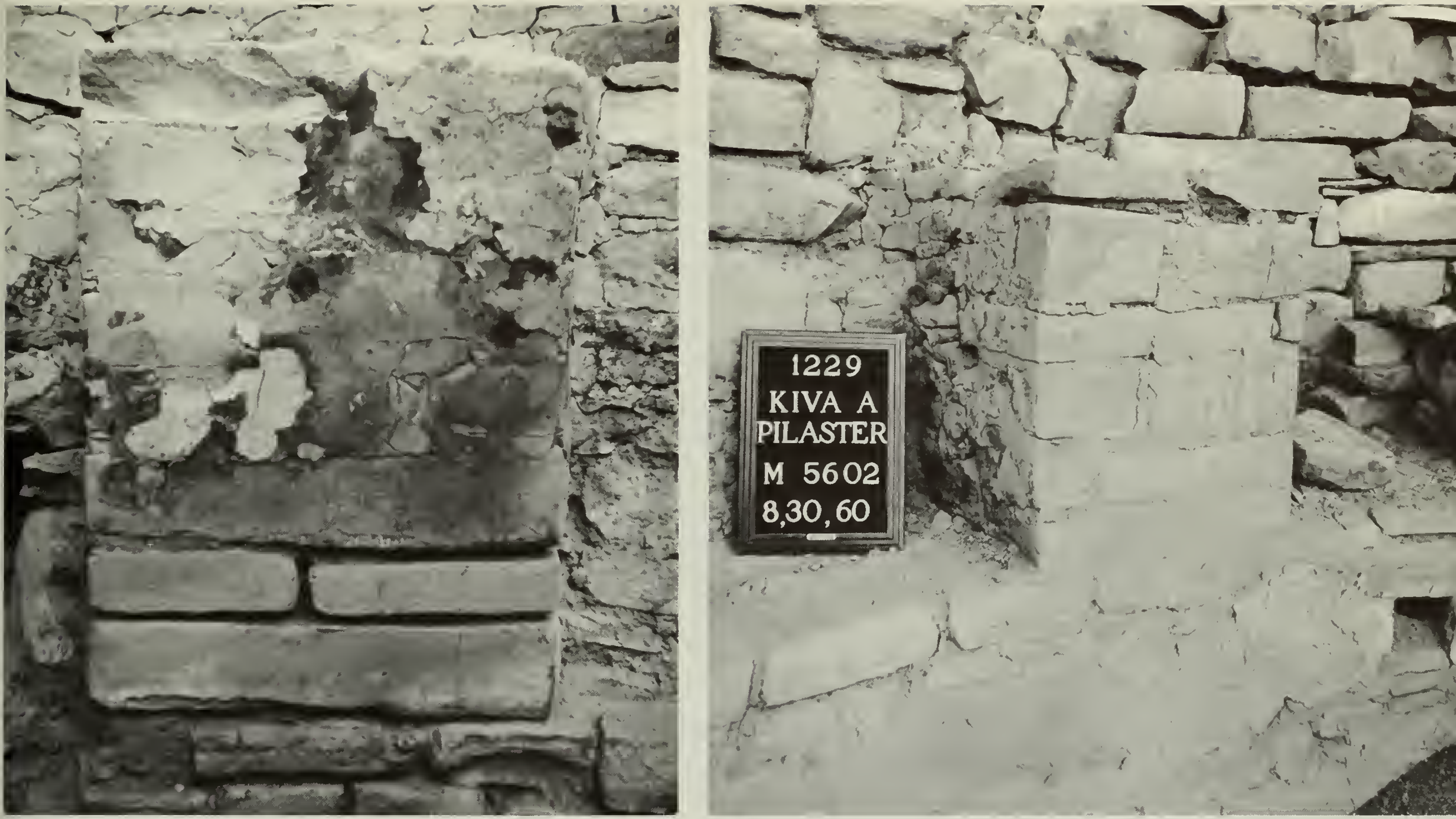
Kiva banquettes are often referred to as benches, with the implication that persons could sit on them. However, their average height above floor (over twice that of the average height of a chair seat), their customary shallowness, the limited amount of headroom (even the average Pueblo Indian would knock his head on the roof timbers), the occasional presence of obstructions such as the suspension poles between pilasters in Kiva C, all would argue against the notion that people sat on them. More likely, the banquette was a shelf on which tools, utensils, and other materials could be set or stored. We found many such items on the banquettes of all the Mug House kivas that apparently were still in use up to the time of final abandonment. Pottery vessels, bone awls, an antler flaker, hammerstones, stone axes, abrading stones, smoothing stones, grinding stones, scrapers, utilized flakes, and sundry stone cores and flakes were all discovered on kiva banquettes.

Pilasters

Each of the six circular kivas has six masonry columns or pilasters rising upward from the banquette level in front of the upper lining wall. These pilasters are not placed equidistant from one another around the perimeter, but are arranged in two groups of three directly opposite each other across the main axis of the kiva. In any one kiva, the distances between pairs of adjacent pilasters fall into two groups of nearly identical measurements. The two distances that cross the kiva axis—that between the pilasters flanking the recess and that between the two pilasters directly opposite these two—exceed by 1 foot or 1½ feet the other four distances between adjacent pilasters (fig. 74). The pilasters in all six of these kivas are set back approximately 0.1 foot from the front edge of the banquette.

The nearness of two prominent exterior corners necessitated a great deal more care in the shaping and dressing of stones set in pilasters than in any other part of kiva masonry (fig. 73). Widely different sizes of stones were used, ranging from large blocks extending the entire width of the pilaster to small pieces needed only to fill a small gap. The rare grinding visible on building-stone faces in Kiva B is found only on stones in some of the pilasters (fig. 73a). The pilaster sides, less visible and therefore less evenly faced, consistently flare from front to back, approximately along different radii of the kiva. Typically, a pilaster was bonded to the upper lining wall, but in several examples, particularly in Kiva B, the pilaster simply abuts this lining wall.

Perhaps the most striking aspect of the pilasters is their consistent dimensions. Twenty-five measurable pilasters in Kivas A, B, C, D, and G—the five kivas located in the northern portion of Mug House—vary no more

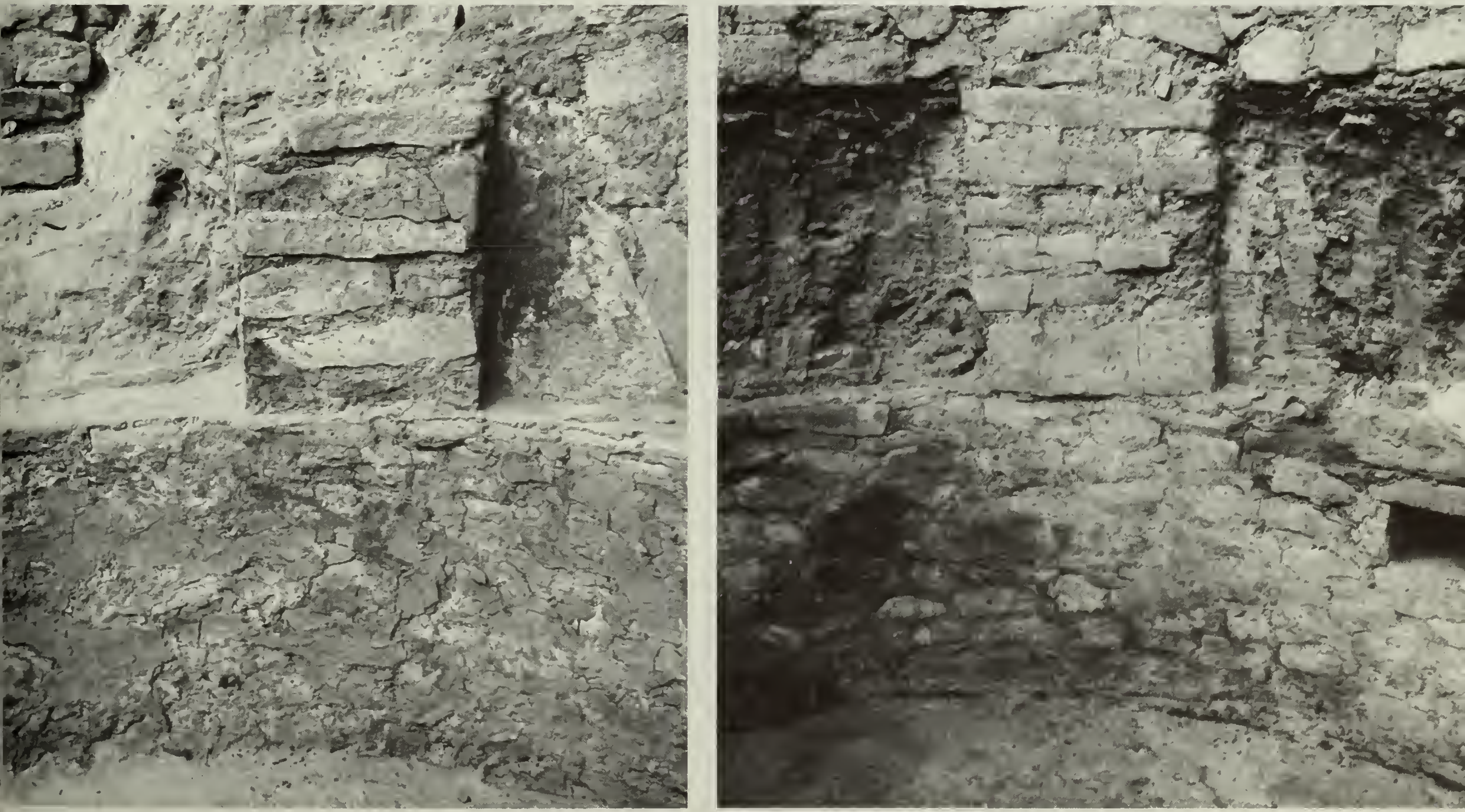

1229
KIVA A
PILASTER
M 5602
8,30,60

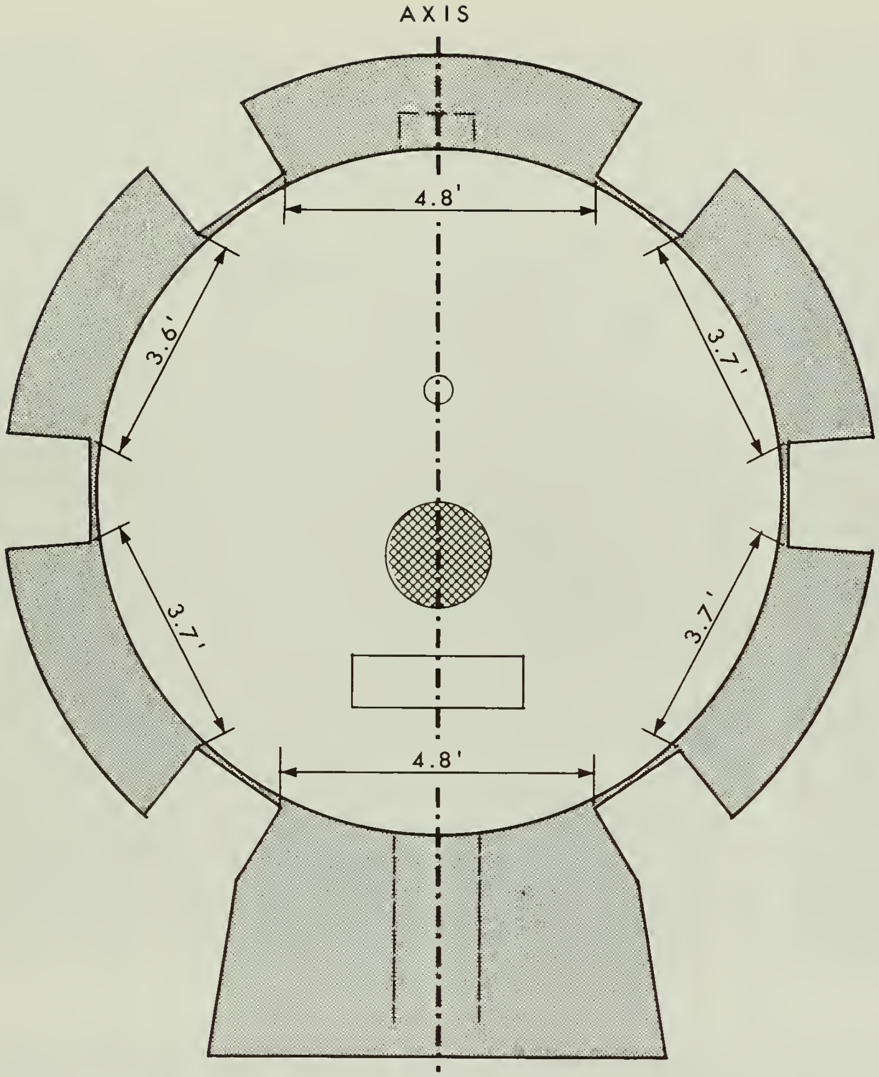
73 Pilaster construction in (a) Kiva B

(b) Kiva A

(c) Kiva H

(d) Kiva D





74 Interpilaster measurements in Kiva B.

in width from one to the next than they do individually from top to bottom. The total range of variation falls between 1.7 to 1.9 feet, and both extremes are found in several of the individual columns. One would expect a certain amount of variation from one kiva to the next reflecting the work of the different builders. But even though these five kivas vary somewhat in size and must have been built over several generations, the pilaster widths are unexpectedly constant. Interpilaster distances vary from kiva to kiva, although they follow a uniform pattern within each (fig. 74). Thus we must assume that each successive builder actually measured the pilaster width in some already existing kiva and built his own pilasters to match.

There is no doubt that pilasters served primarily to support a roof. Several partially intact roofs resting on pilasters have been found at Square Tower House on Chapin Mesa (Fewkes, 1920). This was almost certainly true for five of the kivas with pilasters at Mug House, but the remodeled condition of Kiva D must stand as an exception. Originally, Kiva D's pilasters apparently did support the roof. Following a fire, however, the remodelers laid poles between the pilasters, then added about 2 feet of additional masonry flush with the fronts of the pilasters (fig. 73d). The roof timbers were then laid directly from one wall to the other, and the pilasters served only to help support the new upper masonry wall.

Kivas E and F have no true pilasters. The convolutions in the upper wall of Kiva E produce what might be considered either four broad pilasters or four shallow recesses. The latter interpretation is preferable, since the so-called pilasters are not offset from the lower lining wall at banquette level, as are the true pilasters, and they take up more wall space than the four recesses. These recesses are covered, in much the same way as the interpilaster spaces in Kiva D, by poles and about 1 foot of masonry to the level of the ceiling.

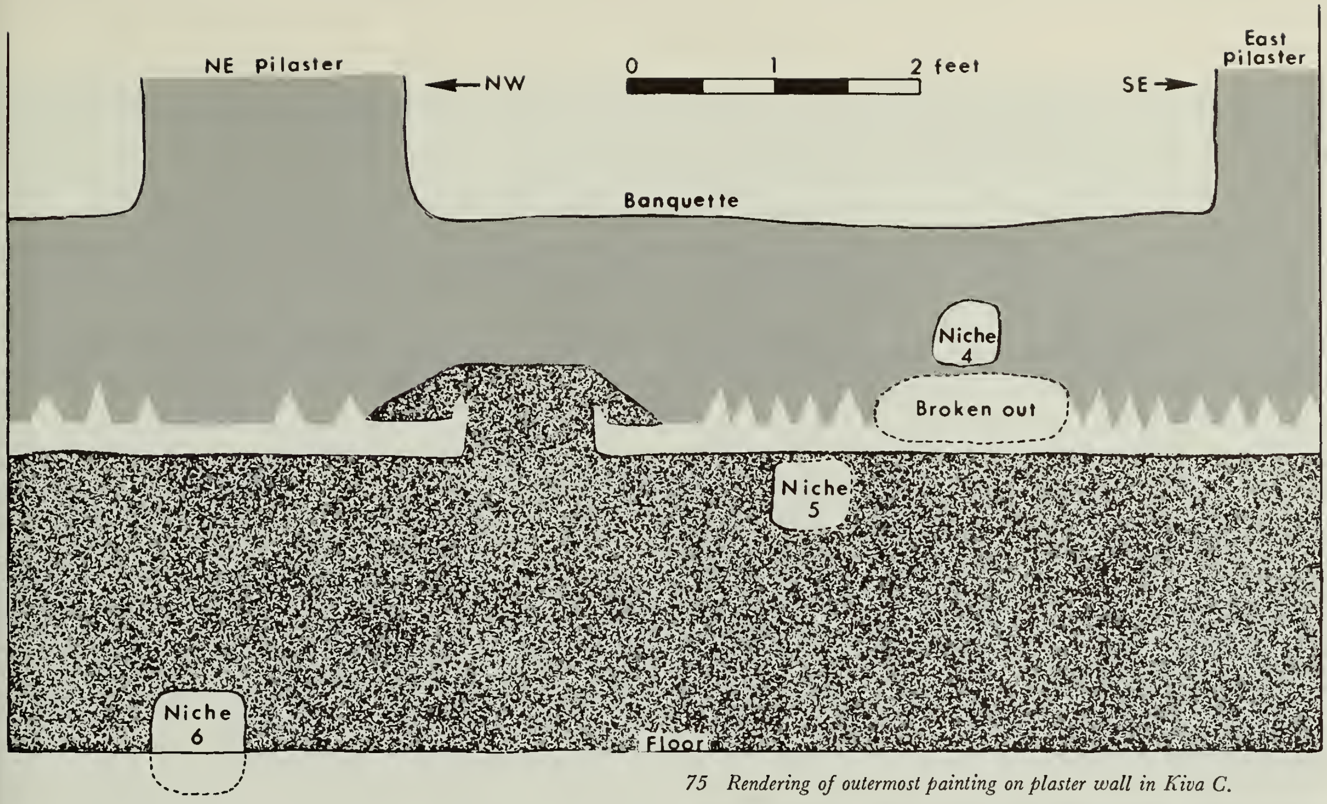
Plaster

The interior surfaces of all kiva walls bore remnants of plaster, but not all portions of the walls were treated identically. The upper lining wall, above banquette level, and the sides of the pilasters usually carried a single monochrome coat, except in one instance. The front faces of all pilasters were always plastered. They seemed to act as extensions of the lower lining wall and were usually covered by several coats of plaster. The lower lining wall in all kivas bore three to nine coats of plaster, some of which were decorated. Occasionally, as in Kivas C, D, and E, the masonry deflector was covered with at least one coat of plaster.

Almost all the individual plaster coats consisted of a very thin brown or tan adobe body that had probably been acquired from Adobe Cave. Only in Kiva G was the reddish-brown, mesa-top loess used instead. Marks on the surface of the layers suggest that the adobe was either brushed on or smoothed with brushes. The surface of almost every coat had been partially smoke-blackened, and several layers showed the effects of fires that had damaged some of the structures.

Monochromes were the rule in Kivas B, D, and E, but all others had a combination of two or more colors, and definite figures and designs were observed in Kivas A and C. It was customary to apply white to the upper portion of the wall directly below the banquette and either to leave the lower portion the natural brown or apply an additional coating of red or red-orange.

Red and white were added to four of the nine plaster layers in Kiva C, although only on the outermost layer was a trichrome effect achieved (fig. 75). On this layer a band of deep red covers the lower 2 feet of wall, allowing the natural tan color of the plaster body to show through for the upper portion. Where these two colors meet, a 0.2-foot-wide band of white almost completely encircles the kiva. It is now impossible to tell whether the white band arched above the opening of the ventilator, or whether it was broken there. Nearly opposite the ventilator there is a definite gap or break about 0.9 foot long through which the red wells upward into the zone of tan. Numerous white triangles project from the top edge of the white band like mountains. To the left of the break there is first one pair of triangles, and then six groups of three each. A continuous row of 34 triangles can be counted toward the right, before the peeling plaster obliterates the sequence (fig. 76). Eleven other triangles are visible still farther to the right and may originally have been part of the series. On two of the undercoats in this same kiva, similar triangles project



75 Rendering of outermost painting on plaster wall in Kiva C.

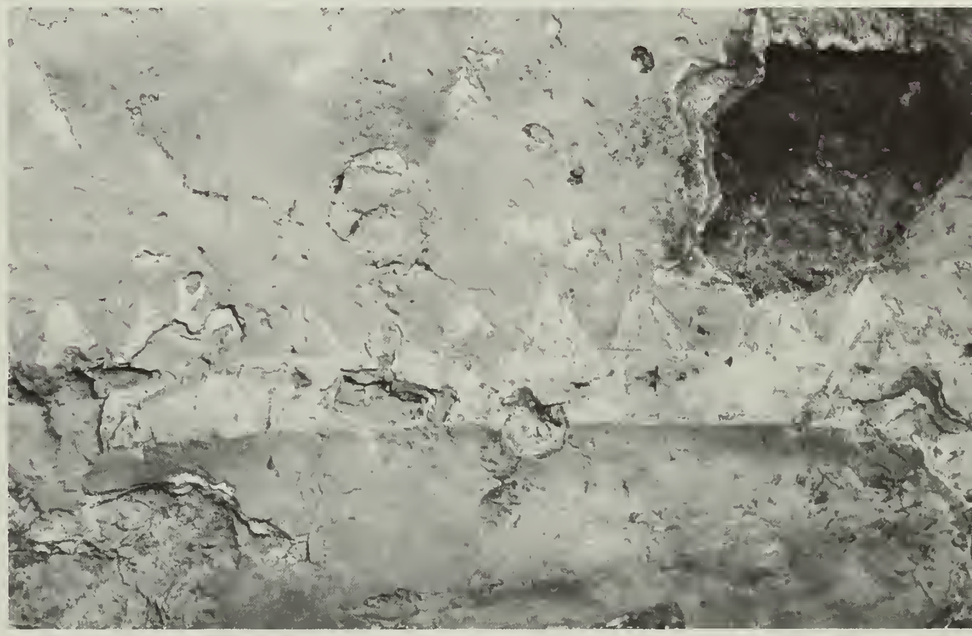
upwards from an orange-red lower portion into a white upper portion. A row of orange-red dots marks the color boundary between groups of triangles (fig. 77).

Only scattered remnants of the plaster still remain in Kiva A. In 1935, Lancaster noted a pair of red birds facing each other on a white background, but prior to our work in Mug House a large sandstone block slid into the kiva and destroyed them. Parts of still another blue-green bird and a bird track in the same color, painted on an undercoat, were also destroyed. Now only a trace of the blue-green color against the white background can be seen.

Apparently it was the custom to renew periodically the plaster in kivas and to decorate the successive layers with geometric patterns and figures. Perhaps some of the decorations played specific roles in certain rituals, or there may have been a correlation between periodic replastering and a ceremonial cycle. Some of the layers were definitely applied in the course of remodeling, possibly after damage by a fire, but most were put on for some other reason.

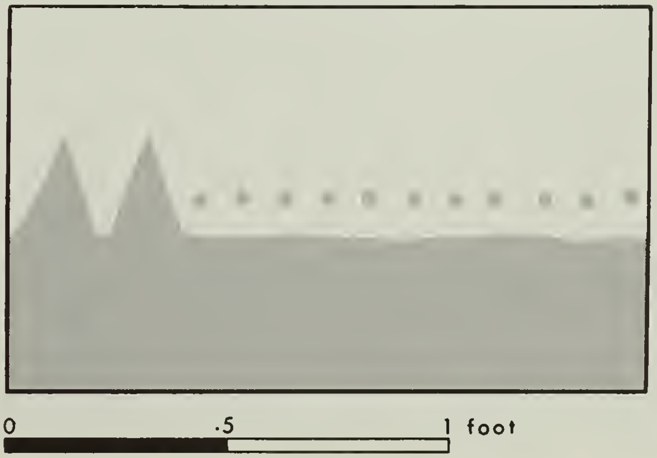
Roofing

No part of a kiva roof was found in place, but pieces of roofing material have been found in every kiva except Kiva A, and the pilasters and walls that supported roofs are still at least partially intact. We can assume that all kivas with six pilasters, except the remodeled Kiva D, had cribbed roofs like those in Square Tower House (Fewkes, 1920, pp. 53–55; Watson, 1954, p. 23, lower left). Sets of poles are stretched between tops of adjacent pilasters forming a rude hexagon. Other sets of poles are then placed upon these to form successive hexagons with points overlying the straight sides of the preceding one. From three to eight layers of this kind of cribbing were constructed before larger timbers spanned the remaining opening. Kivas D, E, or F could not have had cribbed



76 White painted band and triangles on plaster wall in Kiva C.

77 Rendering of early wall painting in Kiva C.



roofs, because they had no pilasters, or the pilasters were already covered with additional masonry. In these three cases, the large roof timbers must have rested directly on the tops of lining walls.

Juniper predominated among the various charred and wooden scraps of roofing material recovered from the kiva fills, especially for the large timbers and the smaller poles, some of which were split. Douglas-fir and pinyon were the other woods employed. Twigs and branches of serviceberry, big sagebrush, oak, and mountain-mahogany, together with juniper bark, probably formed the tight layer over which adobe was spread to produce the level courtyard floor.

In each case, an opening must have been left in the roof, presumably near the center, through which entry into the kiva could be gained and smoke from the hearth could escape. Except for the tunnels of Kivas B and C, there was no other way to enter the kivas. The only direct evidence for hatchways is a large sandstone hatch cover in the fallen debris of Kiva E.

Flooring

Kiva floors were made in much the same manner and of the same material as ordinary dwelling-room floors. They ranged in thickness from 0.04 to 0.25 foot. Brown adobe was employed in Kivas F and H, buff-colored mud in Kiva C, reddish-brown, mesa-top loess in Kivas B and E, and the blue-gray pulverized shale in Kiva A. The floor of Kiva G consisted of a mixture of the red-brown loess and pulverized shale. Superposition of floors was found only in Kiva C, where a new set of floor features accompanied a partial reflooring, apparently in connection with remodeling of the kiva.

Ventilators

Every kiva had a ventilator: that is, a narrow L-shaped tunnel through the lining wall at floor level, passing beneath the recess and rising to an opening in the courtyard outside. Sandstone masonry lined the sides of both the horizontal and the vertical parts of the shaft. Split juniper shakes laid side by side, occasionally capped with smooth sandstone slabs, covered the horizontal tunnel beneath the adobe floor of the recess.

The ventilator allowed fresh air to be drawn into the subterranean chamber to replace stale air which, when heated by the fire, escaped through the hatchway in the roof. It is not surprising to find the ventilator on the side of the kiva toward the opening of the cave. If the structure were near enough to the opening, the ventilator could be placed on the traditional south side, as is the case with Kivas G and A. The tradition of southern orientation must have been strong, however, because in both Kivas B and H, with the ventilator on the west side, the horizontal tunnel jogged toward the south and rose at the southwest corner of the recess.

Ventilators were much too small for a full-grown individual to crawl through, except near the interior opening to the kiva. The vertical shafts and exterior openings averaged a little more than 1 foot square, while the interior openings averaged 1.8 feet high and 1.2 feet wide. Apparently the horizontal tunnel was sometimes used as a place to keep things, for the one in Kiva B held a large waterworn cobble that served as an anvil or lapstone. On the floor of the Kiva H tunnel was the nearly complete skeleton of a young desert cottontail and the long bones of another. Seventy-five bones of cottontails, rock squirrels, and turkeys were found in the Kiva C ventilator.

Deflectors

To prevent drafts from the ventilator blowing on the fire and to circulate air around the kiva, a deflector was erected between the tunnel opening and the hearth. Seven kivas still retain deflectors. Apparently when the eighth, Kiva B, ceased to be used, it was partially razed and the deflector, among other features, was destroyed. The deflectors average 3 feet long and are from 1.5 to 2 feet high. Only the deflector in Kiva G is joined to the walls; the others are free-standing.

Deflectors were constructed in one of two ways. More common was the masonry block wall, averaging a little less than 1 foot thick, found in Kivas C, D, E, and F. In Kiva G, both ends of this masonry block are connected to the kiva liner wall by additional arcs of masonry. A small floor-level hole through each of these arcs let air circulate along the walls. The deflectors in Kivas C, D, and E were plastered, and the deflector in Kiva C also contained a niche on the hearth side.

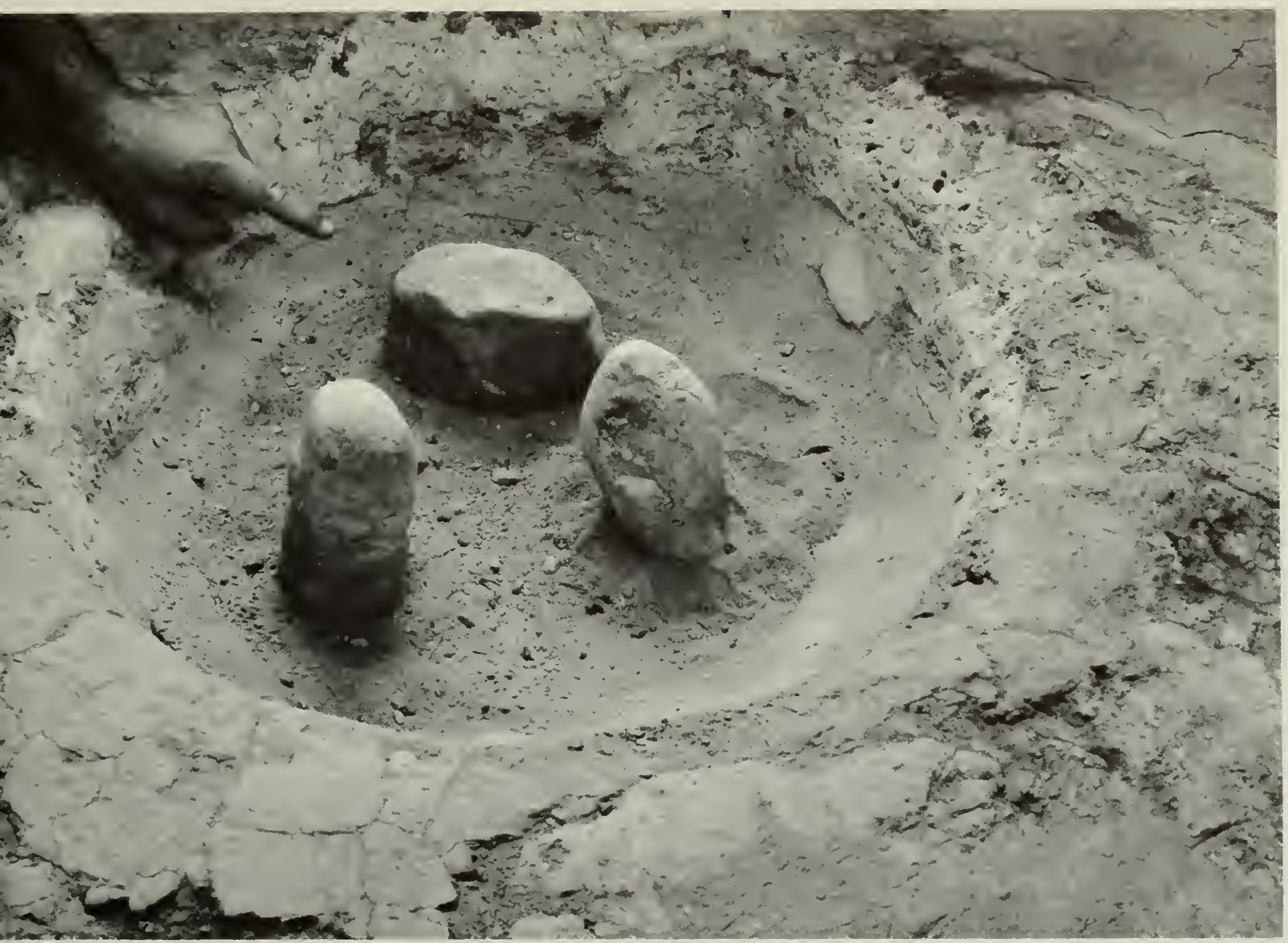
In Kivas A and H, two thin sandstone slabs were set upright, end-to-end, in the floor. In both cases, low adobe collars arced between the ends of the deflectors and the kiva wall, much like the masonry wings of Kiva G. These collars, however, apparently never stood higher than about 0.2 foot. In addition, a slender pole stood on each side of the Kiva H deflector, perhaps to help support the thin slabs.

Hearths

Roughly circular, ash-filled basins, averaging 2 feet in diameter, occupy a nearly central position in the floor of each kiva. Fires burning in these hearths provided heat and light and set up the air pressure differential that would draw in fresh air through the ventilator. In each case, the kiva floor rose smoothly to a low rim encircling the basin. The sloping sides of the hearth were lined with clay, occasionally spread over small sandstone slabs, and the bottom was unlined. The remodeling of Kiva C that established a new floor and sipapu also changed the shape of the hearth from square to circular. Smoke-blackening on the upper liner walls of the kivas shows that smoke expulsion, presumably through the hatchway directly above the hearth, was not always too efficient.

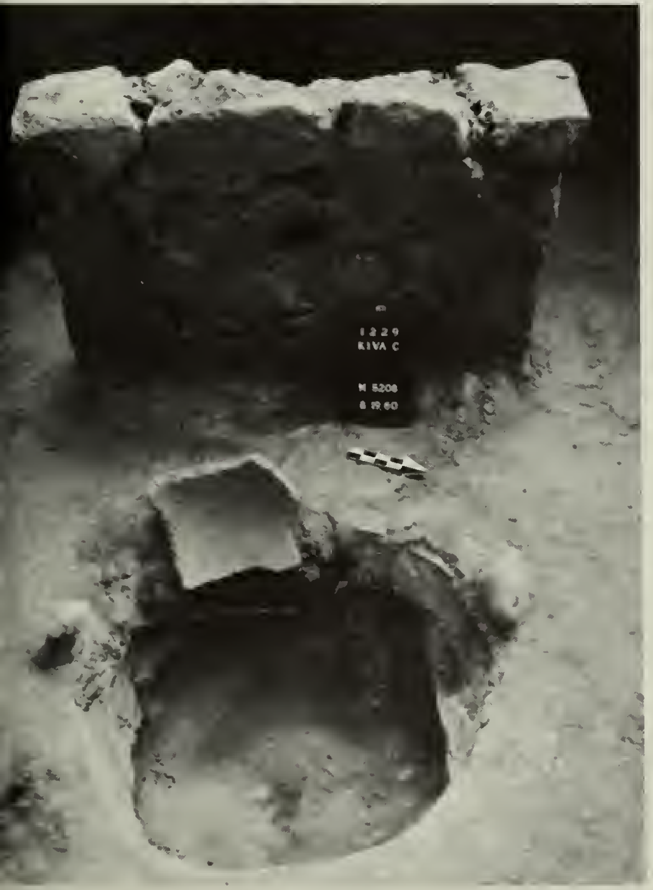
Small sherds, stone chips, tiny bone fragments, and utilized flakes were found in the ashes of five of the six kivas that were apparently still being used at the time of abandonment. The sixth, Kiva A, had been completely excavated prior to our work. It seems possible that all of these objects may have fallen accidentally into the fireplace.

As in many of the room hearths, pot supports were found in the hearths of Kivas C, D, F, and H (fig. 78);



78 *Pot supports in kiva hearth.*

79 *Hearth with embedded pot supports in Kiva C.*


1229
KIVA C
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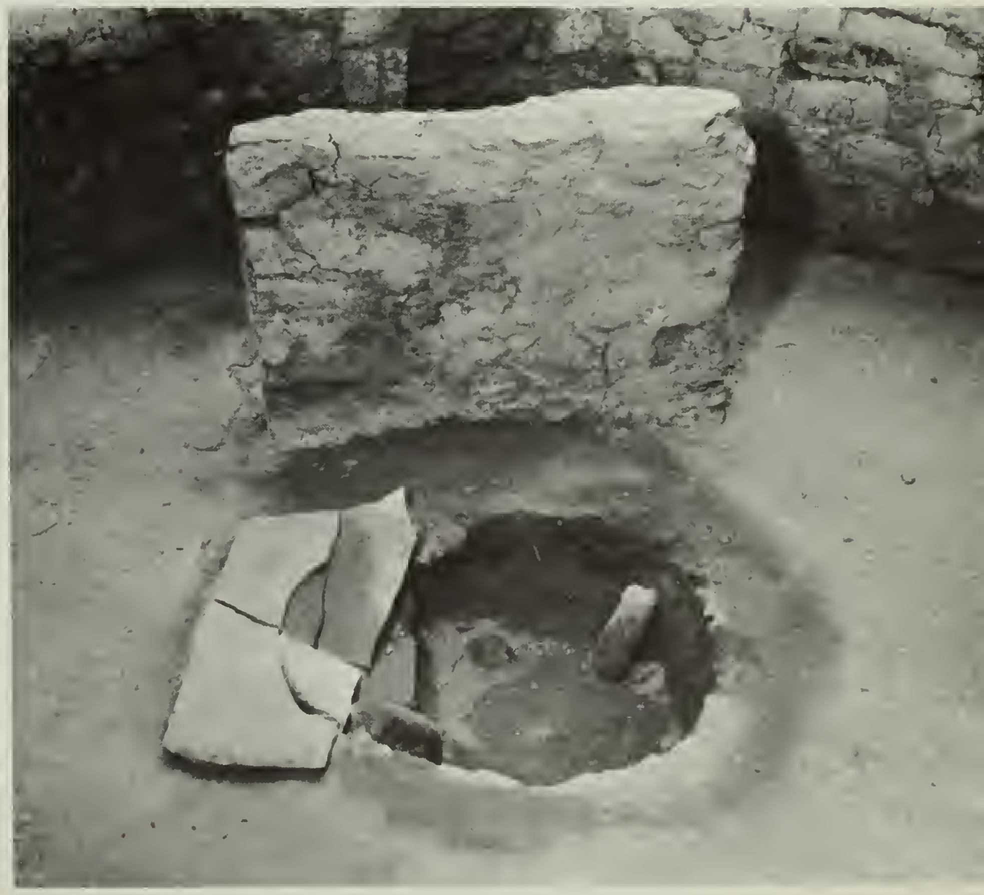
8 19 60

80 *Hearth with pot supports and sandstone slab fragment in Kiva D.*



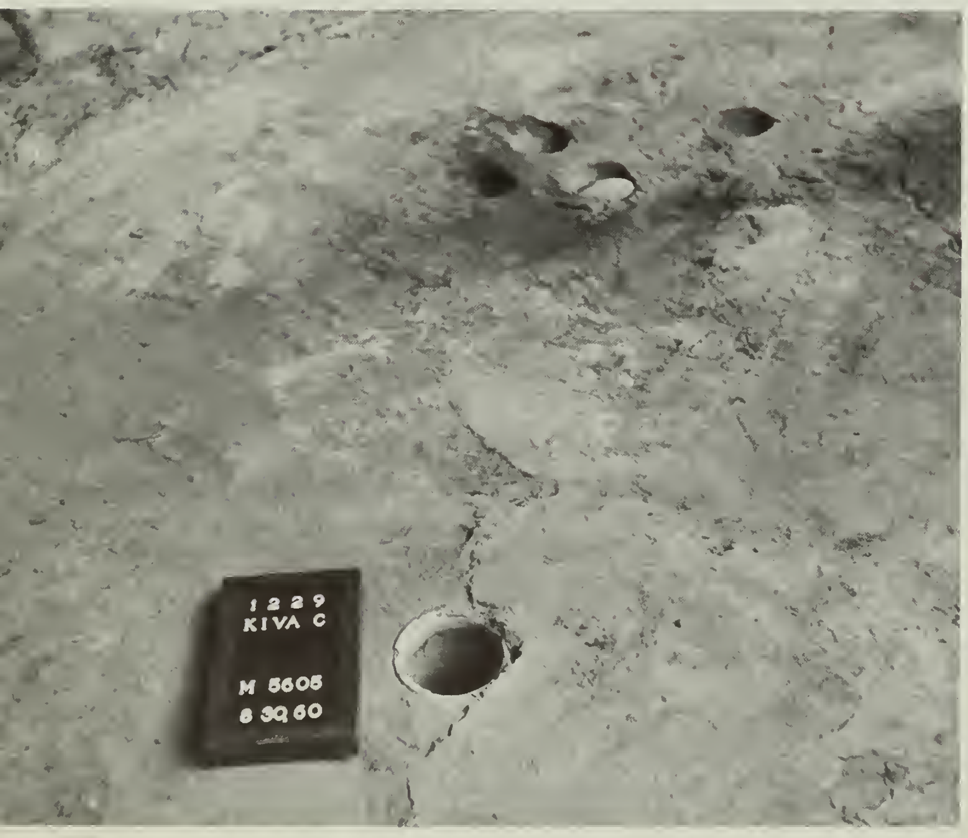
and in Kiva E, several were piled up on the floor next to the hearth. In Kiva C, two pot supports were embedded in the sides of the hearth, one opposite the other (fig. 79). Three were similarly embedded in the sides of the hearth in Kiva D, two of them supporting a broken sandstone slab that extended over one side of the hearth (fig. 80). Undoubtedly, this slab was broken when the kiva roof fell. It could have served as a heating stone, although it was not impregnated with grease and therefore would have been a poor griddle. It may have acted as a sort of deflector to prevent all of the heat from rising directly to the hatchway, keeping some of it near the floor.

Sipapus

Unlike the features we have just been discussing, sipapus were not common to all kivas. They were absent from Kivas A and D. These small, round holes in the floor, averaging from 0.25 to 0.43 foot in diameter and up to 1 foot deep, have been identified as the equivalent of similar features in modern Pueblo kivas, where they serve as symbolic entrances into the spirit world beneath the earth's surface.

In Mug House, it was customary to use the broken-off neck of a pottery water jar, or olla, as a lining for the opening of the sipapu (fig. 81). Jar necks are still in place in the sipapus in Kivas E, F, and C (two of them). The damaged sipapu in Kiva B may originally have held a pottery jar neck. All five of these features were filled with a fine sand ranging from yellow through orange-brown to brown in color. Only in Kiva F were a few charcoal specks, chips, and one small potsherd found in the fill of the sipapu.

81 Jar-neck lining of sipapu in Kiva C.



The sipapu in Kiva H is only about one-third of a foot deep. Completely lined with clay, and containing a mixture of gray clay and ash, it was plugged with gray clay smoothed over at floor level. A circular crack in the clay floor led to its detection. Since the older of the two sipapus in Kiva C had been sealed in a similar manner, it would seem that both were not intended to be used again. The sipapu in Kiva F also contained a clay plug, but is was loose in the opening, as if it were occasionally removed when the feature was to be used.

Kiva G, like Kiva B, was abandoned while many people still lived in Mug House, but it does not seem to have sustained the same kind of damage as Kiva B. However, where one would normally expect to find a sipapu—that is, between the hearth and the wall opposite the ventilator—we found a rather large pit with very ragged sides and opening. It was about 2 feet deep and measured 0.8 by 1.1 feet across. It contained the same type of rubble and refuse that filled the main part of the kiva and looked very much like a hole dug to retrieve something that had been set beneath the kiva floor.

Since disruption of a typical sipapu would hardly require such an extensive excavation, is it possible that this hole once contained a pottery jar such as was found in one of the Long House kivas?

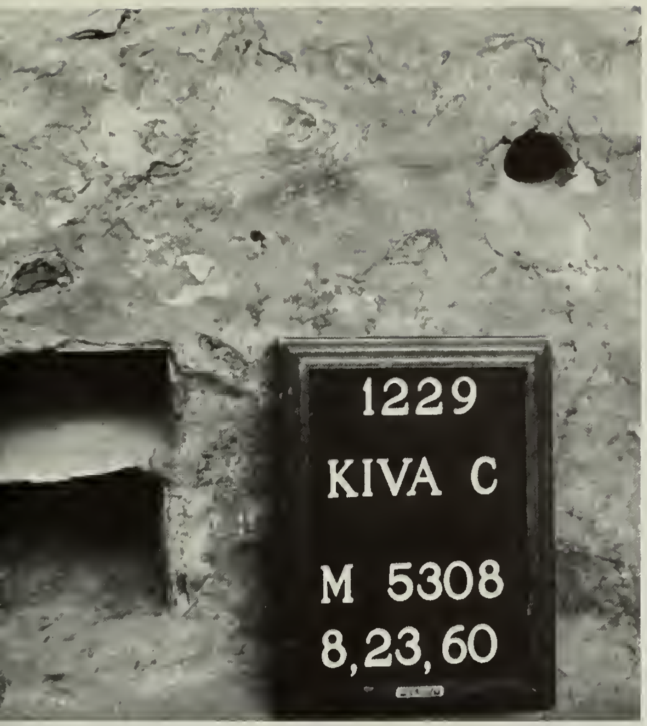
Extensive testing through the floors of Kivas A and D failed to expose a sipapu. Apparently such a feature was not essential to the sanctity or functions of any particular kiva. It is possible that certain societies or certain rituals required the presence of such a feature, but obviously this was not a universal requirement.

Niches

Another feature of all kivas was the wall niche. From one to eight rectangular or round niches were built into the masonry walls of each kiva. Most of them were found in the lower lining wall, below the banquette level, where they could easily be reached by persons sitting on the floor. However, they have been found in almost every masonry surface of the kivas except the pilasters. We observed niches in the upper liner wall above the pilasters (Kiva D), in the backwall of interpilaster spaces and in the recess (Kivas A and B), and in the deflector (Kiva C). Occasionally, thin sandstone slabs were placed on end to form the sides and the back, although the sides of the regular masonry building blocks usually served this purpose. Wall plaster frequently rounded neatly into the opening of each niche, but niche interiors were rarely plastered.

In seven of the eight kivas (the exception being Kiva G, with only one niche), a niche was always found in the lower lining wall directly opposite the ventilator opening. Such consistency implies some special purpose for a niche in this position. Although we found a number of objects in several other niches, only one of the specially placed niches, in Kiva D, contained something—a hematite paint stone.

The 43 recorded niches fall into several size and shape classes. Only two niches, one in Kiva C and one in Kiva F, have round openings, either 0.2 or 0.3 foot



82 Double rectangular and round niches in Kiva C.

83 Large niche in Kiva H.

in diameter and 0.4 to 0.7 foot deep (fig. 82). The one in Kiva F occupies the special position opposite the ventilator shaft. One rectangular niche in Kiva H, opening just above the banquette level (fig. 83), is as large as the opening of a tunnel (1.6 feet wide by 2.0 feet high). In fact, I suspect it was intended at one time to be a tunnel, and the exterior opening was ultimately closed.

All other niches have nearly square openings, some with sharp corners, some with rounded corners. Where the sides are not equal, the breadth always exceeds the height of the opening. Average dimensions cluster around 0.5 foot, with the smallest niche measuring 0.26 foot wide by 0.24 foot high and the largest 1.1 feet by 1.0 foot. The depth of any niche varies with the size of the opening, but it almost invariably exceeds one of the other dimensions. In two instances of a double rectangular niche, one in Kiva A and one in Kiva C (fig. 82), a thin sandstone slab forms the lintel for the lower one and the floor for the upper one. Only one niche, in Kiva C, is larger on the inside, expanding to form two miniature chambers.

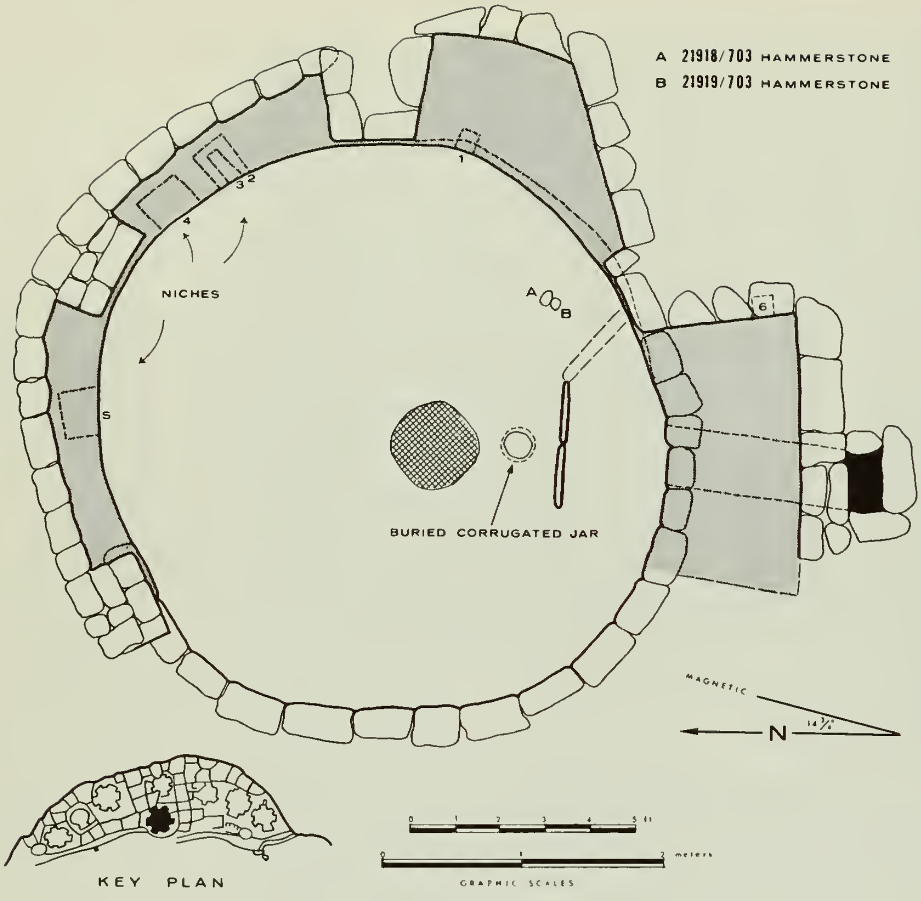
There is no doubt that niches served primarily as places to store things, much like the banquette. We found artifacts in 11 niches, in 6 different kivas. They included such items as the already-mentioned paint stone, potsherds, bone awls and needles, stone scrapers, knives, hammerstones, and utilized flakes, numerous unmodified stone flakes and cores, and, in one case, a small cache of acorns. None of the niches contained dry fill, so we cannot tell whether perishable items were once stored in them.

Orientation

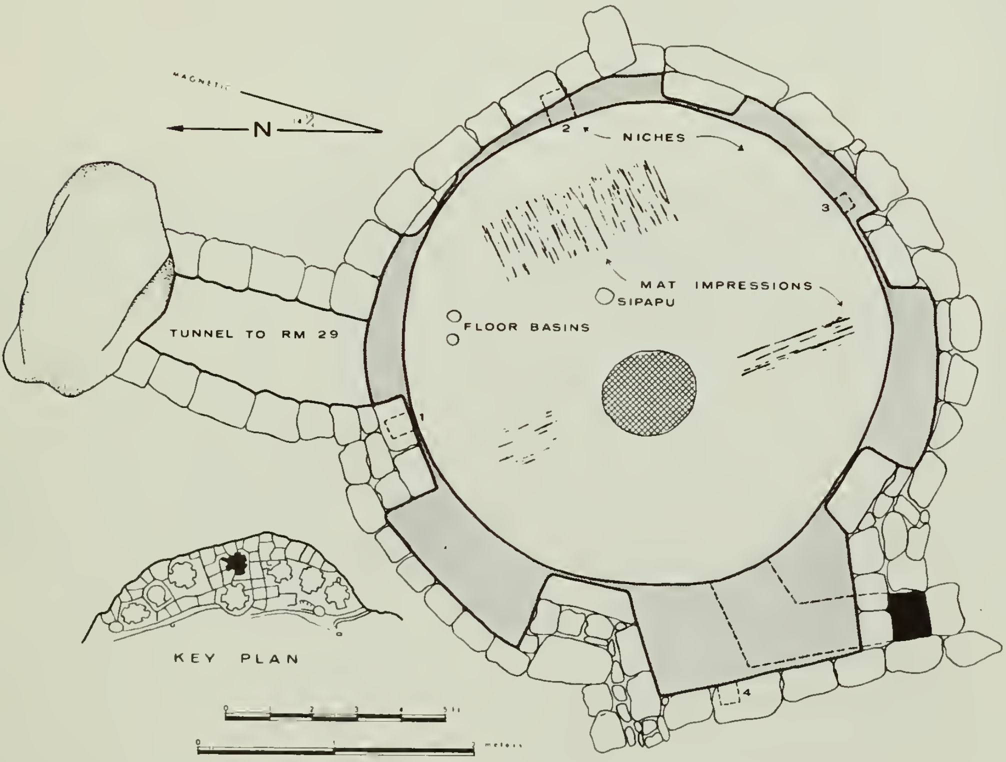
Reference has already been made to the orientation of the kivas. Normally, a straight line can be drawn through the center of the ventilator, recess, deflector, hearth, center of the kiva proper, sipapu, and, in some cases, a niche in the wall opposite the ventilator. The direction of this line, pointing toward the ventilator, is the orientation or axis of the kiva. We can measure it in degrees from one of the cardinal points of the compass.

Where Pueblo builders were not restricted by the topography, such as they were in a rock shelter, they consistently oriented their kivas toward the south or southeast. In the Mesa Verde rock shelters, the orientation was usually shifted toward the open side of the shelter, regardless of direction, although a nearly southerly direction was maintained whenever a kiva was situated outside the overhang. In Mug House, each kiva could have been built with a southern orientation if the builders had so desired. Hence, some factor must have overridden tradition in six of the eight kivas. This factor could have been purely practical—the greater availability of fresh air near the mouth of the shelter—although a southern orientation could have achieved this just as easily if the ventilator had been angled or bent toward the cave mouth. This is just the reverse of the southward turn in the ventilator tunnels of western-oriented Kivas B and H.

Of course, southern orientation in kivas may simply be an expression of the traditional orientation of an entire site, where the secular rooms were arranged around the north side, with the kivas in the center, but pointing south, and the refuse area or trash dump to the south. The topography of Mug House cave required that secular rooms be arranged along the back, or east wall, of the cave; that kivas be dug into the front of the cave where sufficient depth could be reached; and that refuse be deposited down the slope in front of the cave, along the west side. Here, then, the western orientation of the kivas would coincide with the overall orientation of the site. If this is true, why were any of the kivas oriented



84 Kiva A.



85 Kiva B.

toward the south, and why were the two ventilator tunnels turned toward the south?

All other architectural features are found in only one or two kivas and apparently do not belong to the architectural complex of a typical kiva. The following discussion, however, will consider the less common architectura forms while reviewing briefly all the features of each kiva

Kiva A

Roughly circular, this kiva measures about 12 or 13 feet in diameter (fig. 84). Orientation is slightly west of south. The banquette stands from 3.2 to 3.3 feet above the floor. Originally six pilasters supported a cribbed roof, but two had completely collapsed. There are three layers of plaster, at least two of them decorated. Six niches are present: five located in the lower lining wall with one of them opposite the ventilator shaft, and a sixth in the side of the recess. This kiva has a recess, a ventilator shaft, a sandstone slab deflector, and a hearth, but no sipapu. Halfway between the deflector and the hearth a large corrugated jar had been set with its mouth 0.3 foot below the floor level. It was 1.3 feet in maximum diameter, with a mouth diameter of 0.55 foot, and was covered with a circular, chipped sandstone cover, 0.8 foot in diameter and 0.1 foot thick. The purpose of the jar is unknown as it contained only some fine, windblown sand.

Kiva B

This kiva is circular, about 11 feet in diameter, and the orientation is almost due west (fig. 85). The banquette stands 3.3 feet above floor level, and there are six pilasters that once supported a cribbed roof. There are four coats of light brown monochrome plaster. Four rectangular niches are present: three of them in the lower liner and one at the backwall of the recess. Kiva B contains a recess, a ventilator tunnel that bends toward the south, a hearth, and a badly damaged sipapu. Apparently the deflector was entirely removed. Entering the north side of the kiva, about 1.5 feet above banquette level, is a 9-foot-long crawlway, or tunnel, leading into the southwest corner of Room 29. It varies in width from 1.6 to 2.0 feet and probably had an original height of around 2.2 feet. After passing under the northeast corner of the courtyard, the tunnel continues under a large sandstone boulder, on top of which the south wall of Room 29 stood, then enters Room 29 through a D-shaped opening in the floor.

About 2 feet from the northeast kiva wall, two small, hemispherical, clay-lined basins were cut into the kiva floor. One of them measures 0.37 foot in diameter and 0.18 foot deep. It was filled with a fine, gray sand. The other is 0.36 by 0.32 foot and 0.27 foot deep, and was filled with fine, yellow sand. Three-tenths of a foot separates them. Their purpose is open to speculation: the different colored sands may have been kept there for use in dry paintings; small sticks could have been held upright in the sand for some reason or other; or round-bottomed utensils could have rested in these depressions.

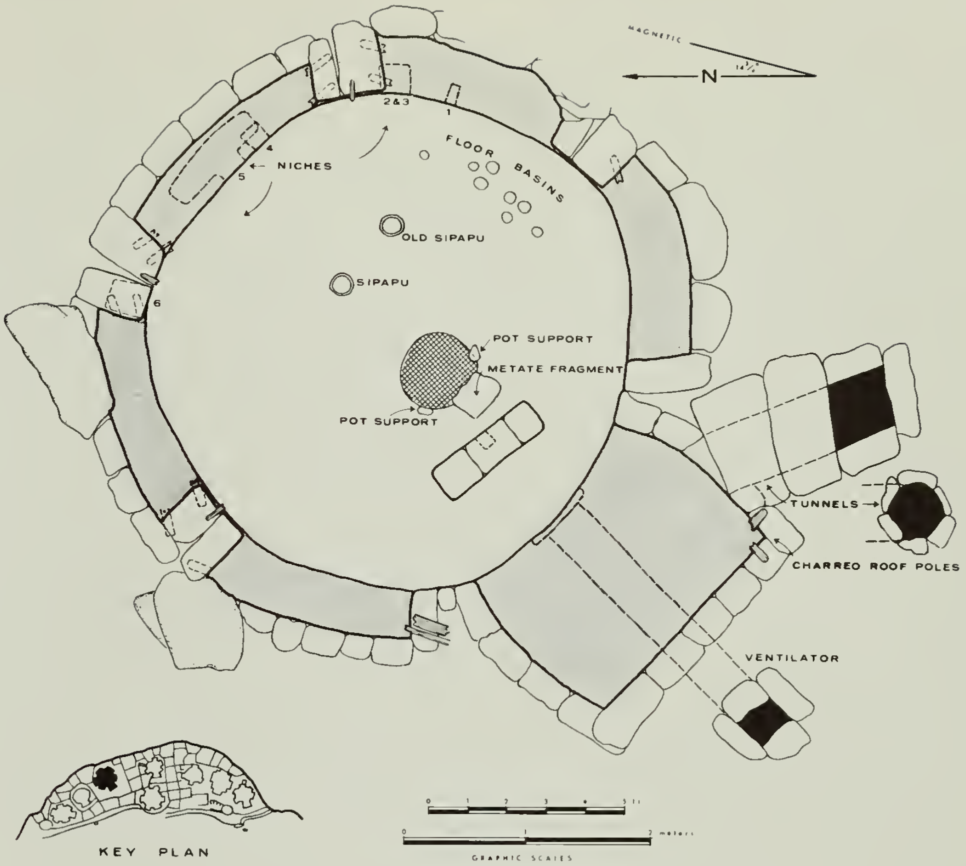
Willow-mat impressions covered extensive portions of the Kiva B floor. These impressions were on three sides of the hearth away from the deflector and ventilator opening, and suggest that much of the floor may have been covered with matting. The floor material must have been still damp when the mats were first placed down, thereby preserving the impressions.

Kiva C

This kiva is circular, about 12.5 feet in diameter (fig. 6). Orientation is to the southwest. The banquette is bout 3.4 to 3.8 feet above floor level, and there are six ilasters that once supported a cribbed roof. At least five f nine layers of plaster were painted. Of the seven iches, one had a circular opening, two were arranged s a double niche, one had a T-shaped floor plan, and nother extended slightly below floor level. One niche as in the deflector and six, including one opposite the entilator, were in the lower liner wall. The kiva conained a recess, a ventilator, a masonry deflector, a earth, and a pottery jar neck sipapu. A masonry-lined unnel, 5.5 feet long, enters the south side of the recess om an opening in the courtyard level outside (fig. 87). he tunnel is only 1.6 feet wide and 2.3 feet high; its dewalls are formed by sandstone blocks set on end, and is roofed by three large and thick sandstone slabs.

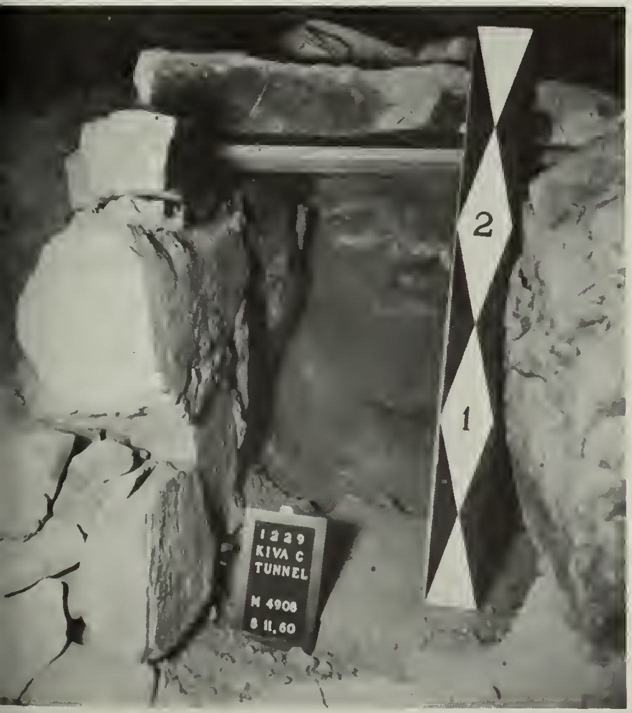
Each of the three pilasters still standing at its original eight has a wall peg set into the top of its front face, idway between the sides. All three wall pegs (two of niper and one of serviceberry) stand about 2.3 feet bove banquette level. Similar wall pegs may once have xisted in the tops of the other three pilasters before they ere partly destroyed. Also, a pair of juniper poles—one t at the front corner and the other at the back corner—retched between each pair of adjacent pilasters about alfway between the banquette level and their tops, xcept across the opening to the recess. Actual remains of of the 10 poles were found, plus the sockets for two thers. Heavy damage to the two southernmost pilasters robably destroyed the tenth.

Apparently early in its history Kiva C burned intensely, eddening the faces of the stones in the lining wall. All ine recorded plaster layers were added subsequent to is burning. We cannot tell, however, whether remodeling of the floor features followed the fire. All we know for certain is that the original floor features of Kiva C included a square hearth, a pottery jar neck sipapu, and a series of eight shallow floor basins similar to those found in Kiva B. The eight basins range between 0.2 and 0.3 foot in diameter and between 0.05 and 0.25 foot deep, and are scattered near the southeast wall (fig. 88). Two of them were plugged with clay and covered by parts of the later floor. A third contained a plug made of sand-

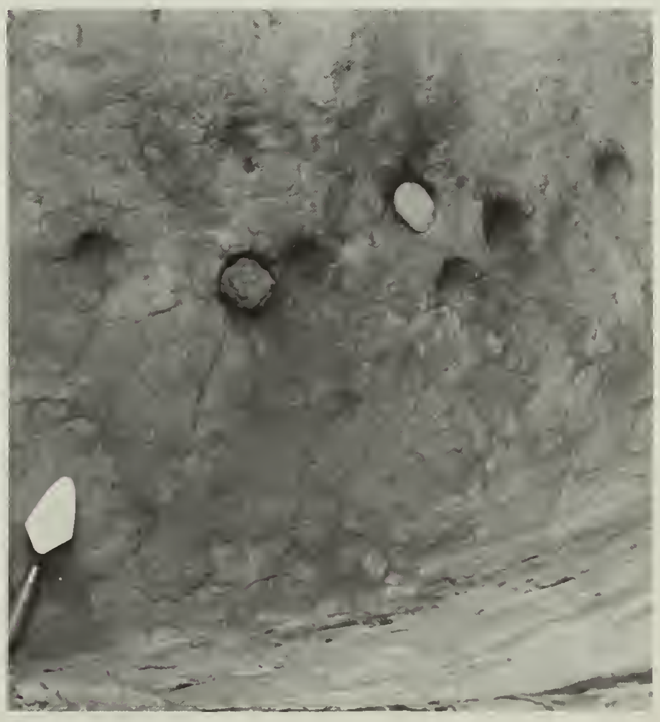


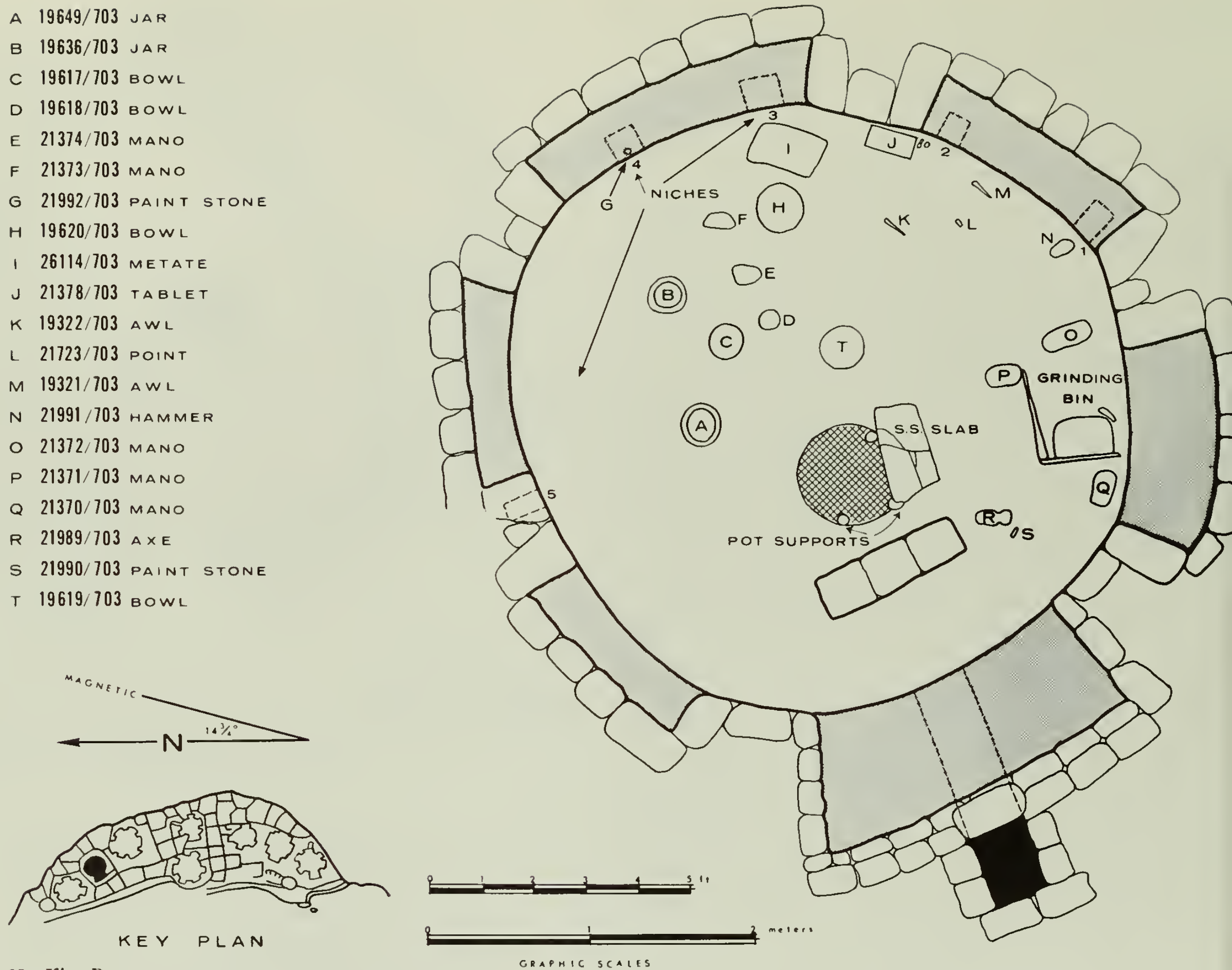
86 Kiva C.

7 Tunnel in south side of recess in Kiva C.



88 Shallow basins in floor near southeast wall in Kiva C.




A 19649/703 JAR
B 19636/703 JAR
C 19617/703 BOWL
D 19618/703 BOWL
E 21374/703 MANO
F 21373/703 MANO
G 21992/703 PAINT STONE
H 19620/703 BOWL
I 26114/703 METATE
J 21378/703 TABLET
K 19322/703 AWL
L 21723/703 POINT
M 19321/703 AWL
N 21991/703 HAMMER
O 21372/703 MANO
P 21371/703 MANO
Q 21370/703 MANO
R 21989/703 AXE
S 21990/703 PAINT STONE
T 19619/703 BOWL
MAGNETIC
N
14¾°
KEY PLAN
NICHES
GRINDING BIN
S.S. SLAB
POT SUPPORTS
1
2
3
4
5
80
0 1 2 3 4 5 ft
0 1 2 meters
GRAPHIC SCALES

89 Kiva D.

stone with nicely beveled edges. These clay basins may have been used in a game or as built-in containers for materials employed in wall paintings.

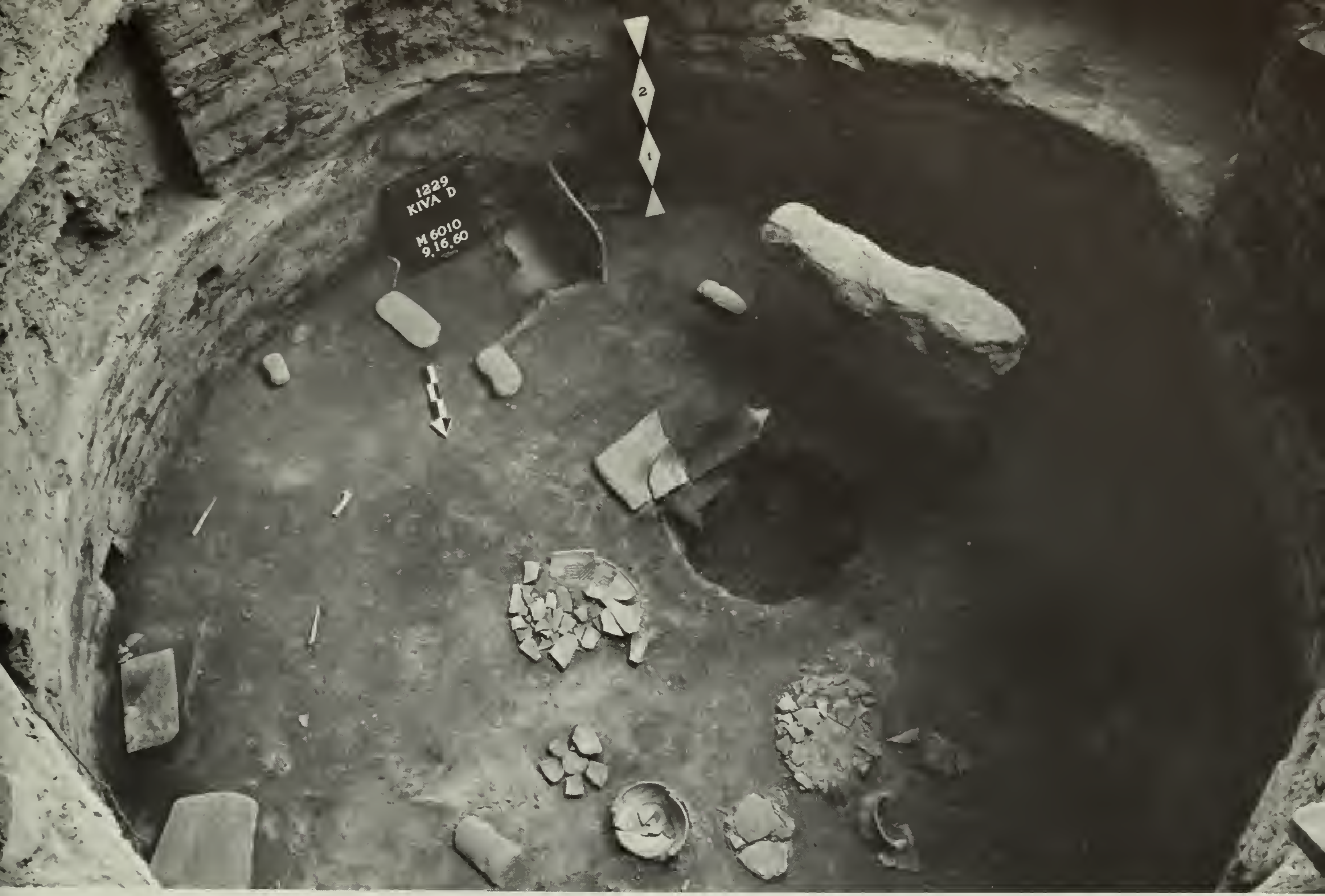
Probably associated with this earlier set of floor features is another tunnel whose opening is located about 2.5 feet west of the later tunnel. A circular, masonry-lined shaft, ranging between 1.5 and 2 feet in diameter, drops about 7 feet to the approximate level of the kiva floor, then turns toward the kiva. However, we found no sign of a plugged opening in the kiva wall, and the debris found in the vertical shaft indicated it had been intentionally filled. This could also be an old ventilator shaft or some kind of passageway that was never completed.

Kiva D

Circular in shape, this kiva is about 11.5 feet in diameter at floor level (fig. 89). Orientation is slightly south of due west. The banquette is 2.7 to 2.9 feet above the floor, and there are six pilasters supporting an upper masonry liner upon which a flat roof must have been placed. At one time, probably as part of the original construction, the pilasters must have supported a cribbed roof. There were five layers of monochrome plaster and seven rectangular niches. The lower liner contains five niches, one of them opposite the ventilator opening; one niche is in the upper liner directly above an inter-pilaster space; and the seventh is in the side of one pilaster. Other features include a recess, a ventilato a masonry deflector, and a hearth. There is no sig of a sipapu.

Against the wall south of the hearth and deflector ar the remains of a grinding bin with only a couple of it enclosing sandstone slabs still in place (fig. 90). The mud lined trough, in which meal collected at the lower end o the sloping metate, is still intact and includes a larg

90 Remains of grinding bin, Kiva D.



1 *Objects on floor of Kiva D.*

herd from a dipper bowl mudded into one corner, preumably to help in scooping out the meal. Since many itilitarian objects were found on the floor of Kiva D fig. 91), the dismantling of the grinding bin must have aken place while the kiva was still being used. A metate ound on the floor could once have been set in this bin.

Thirty-six elements of the skeleton of a young turkey ien were found buried in a small hole beneath the floor, oetween the deflector and the opening to the ventilator haft. This is hardly a logical place to dispose of a pet, ind certainly the carcass served no practical function n that location. Prior to interment, the bird was deleshed—probably eaten—and some of its bones were lost ind others mutilated. Its presence must have had some connection with the construction or ritual use of the kiva.

Three fire-altered sandstone concretions were mudded nto the sides of the hearth. Two of them, along the outh side, supported a thin sandstone slab that exended part way over the side of the hearth (fig. 80).

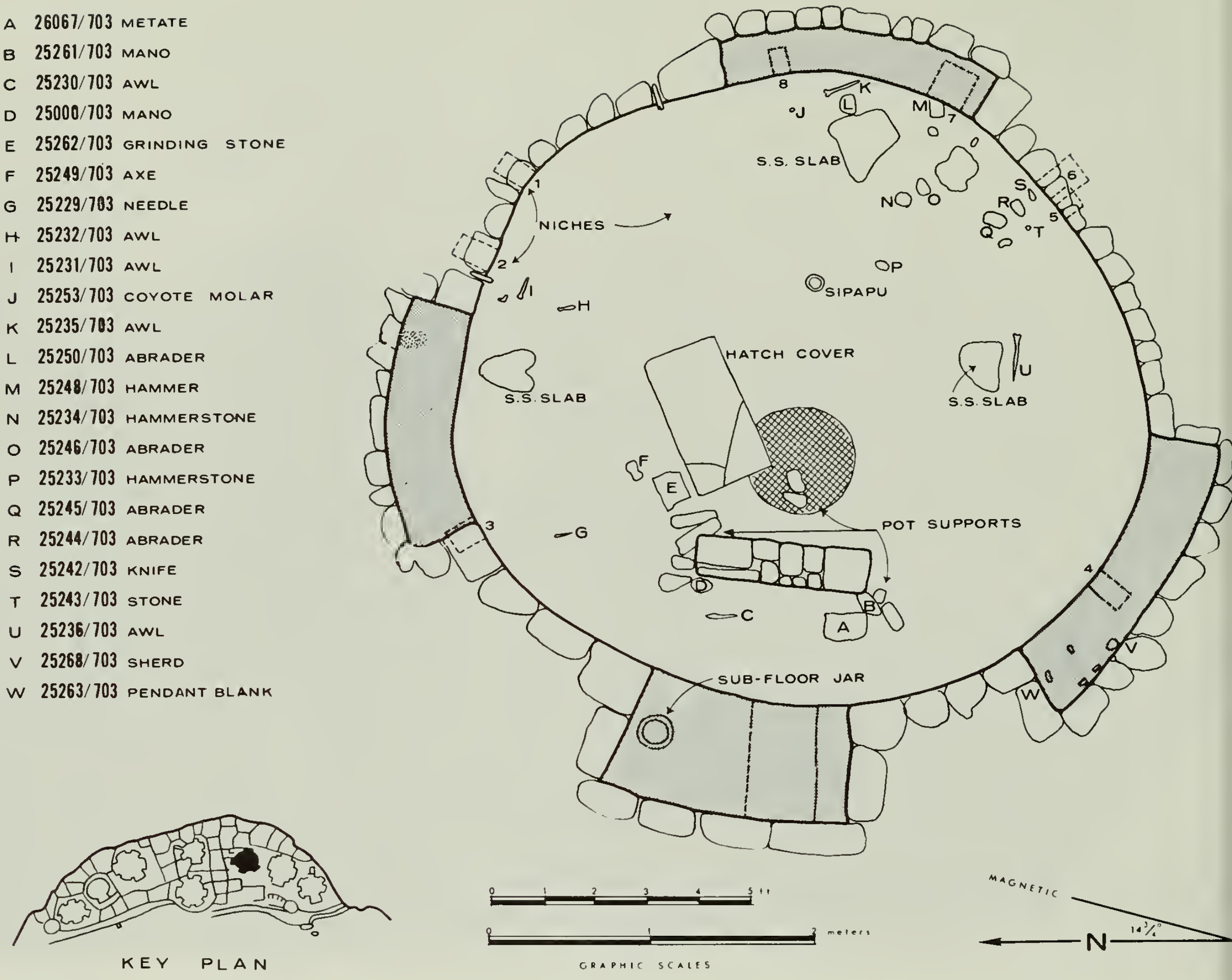
Kiva D had burned, leaving the face of the masonry valls deeply fire-reddened. Subsequent rebuilding added he new upper liner wall, above the tops of the pilasters and flush with the fronts of them.

Kiva E

Approximately circular in shape, this kiva measures 2.4 to 13.3 feet in diameter (fig. 92). Orientation is almost due west. The banquette stands 3.4 to 3.6 feet above the floor level and appears in four shallow alcoves in an otherwise solid liner wall (fig. 93). The main roof timbers must have extended directly across from wall to wall. There are seven layers of monochrome plaster and eight rectangular niches. One niche is in the upper liner; the other seven, including one opposite the ventilator, are in the lower liner. There is no true recess, although one of the shallow alcoves is over the ventilator opening. The kiva has a ventilator, a masonry deflector, a hearth, and a sipapu with a pottery jar neck in it.

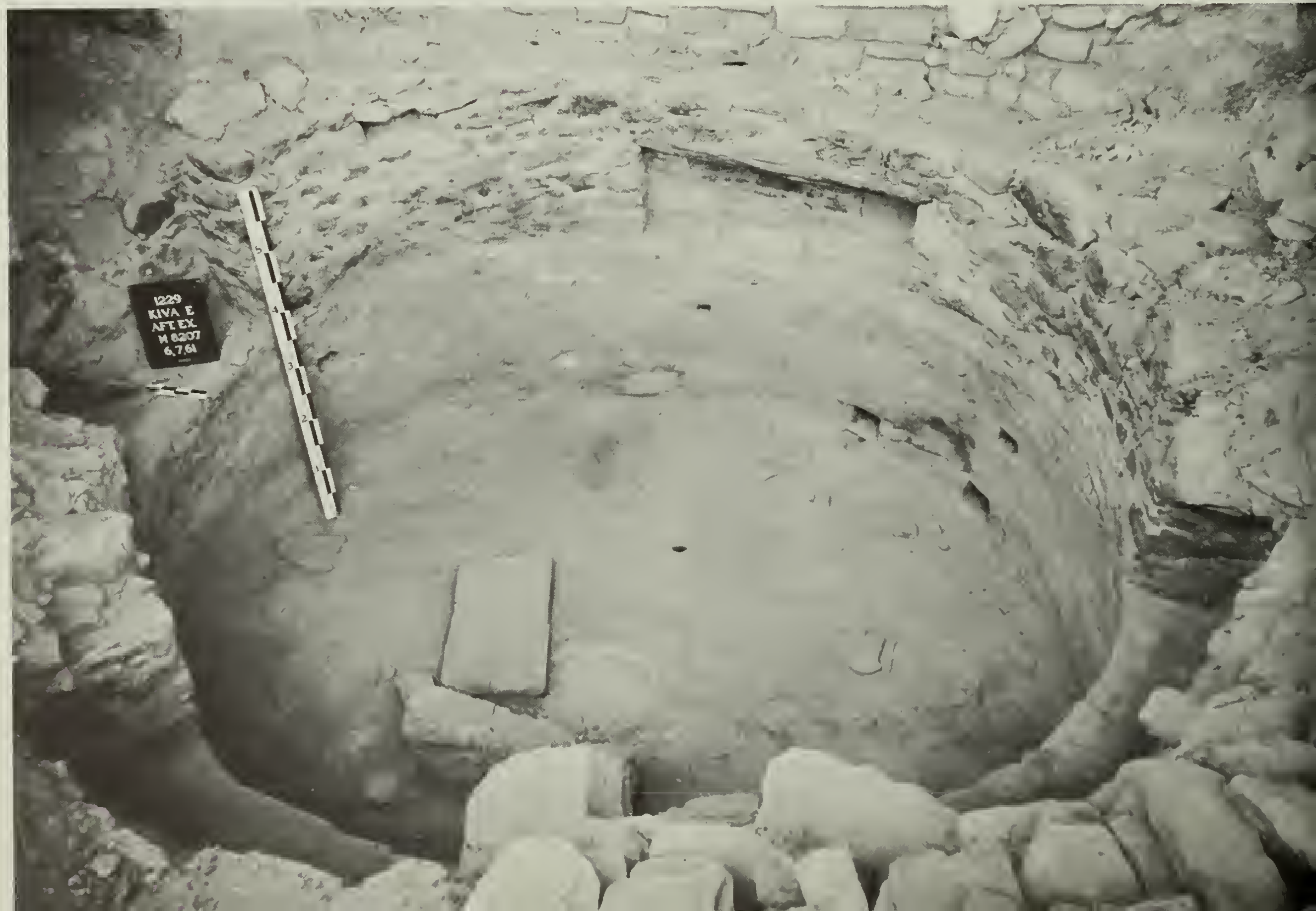
A possible basin-shaped storage cist, about 1.5 feet in diameter and 1.3 feet deep, is situated against the kiva wall just north of the deflector. It held most of two broken corrugated jars, one large and one small, resting on their sides. Trash had been tightly packed around these fragments to bring the fill level with the floor. A large river cobble, about 0.6 foot in diameter, was mudded into the floor 1 foot from the southeast portion of the liner wall so that its upper surface projected about 0.05 foot above the floor level. The center of this cobble shows battering and pecking as if it had been used as an anvil for stone-working.

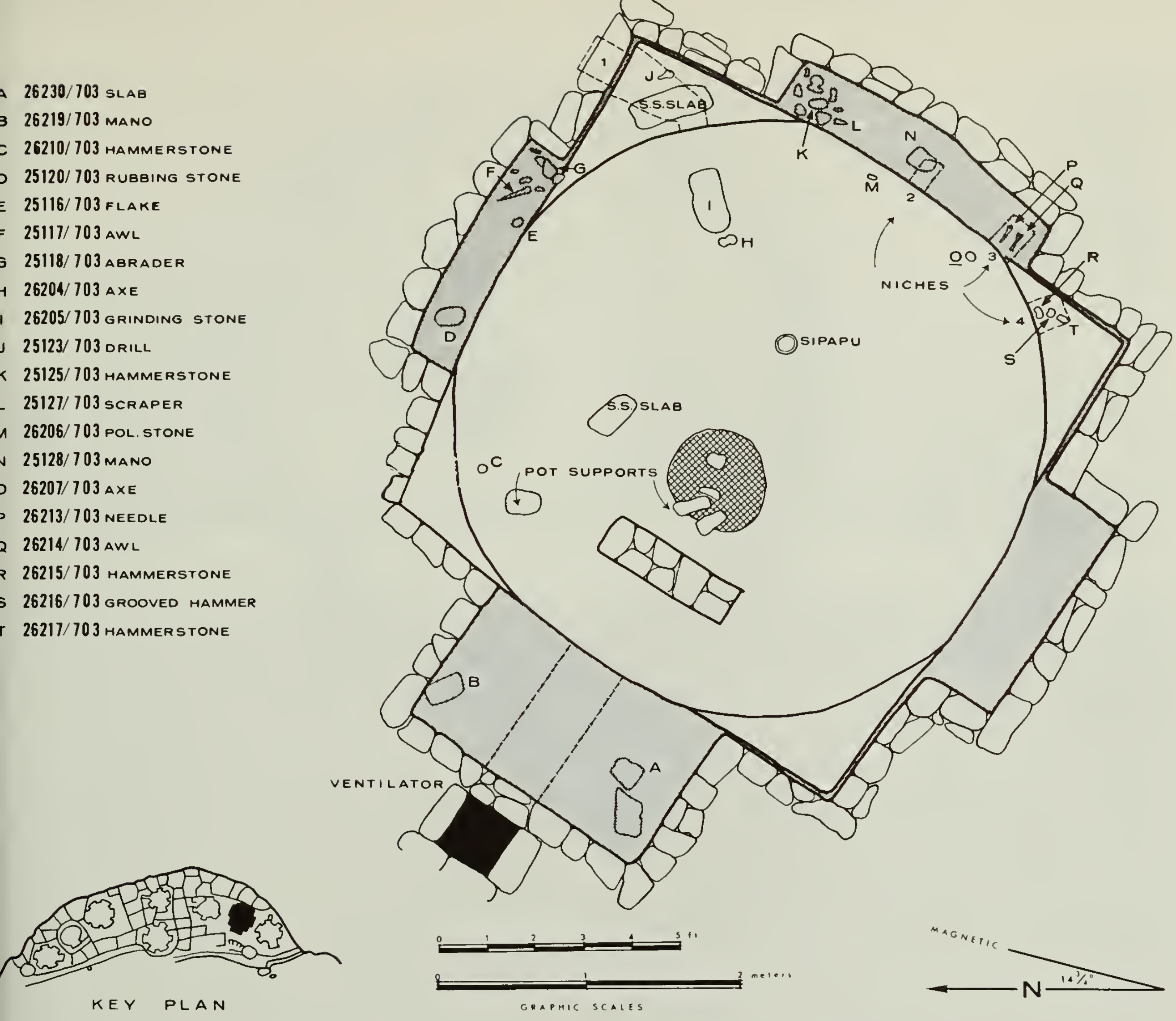
Set under the floor of the westernmost alcove—the one beneath which the ventilator passed—is a small corrugated jar, 0.8 foot in maximum diameter, 0.7 foot deep, and 0.5 foot across the mouth, which rested 0.1 foot below


A 26067/703 METATE
B 25261/703 MANO
C 25230/703 AWL
D 25000/703 MANO
E 25262/703 GRINDING STONE
F 25249/703 AXE
G 25229/703 NEEDLE
H 25232/703 AWL
I 25231/703 AWL
J 25253/703 COYOTE MOLAR
K 25235/703 AWL
L 25250/703 ABRADER
M 25248/703 HAMMER
N 25234/703 HAMMERSTONE
O 25246/703 ABRADER
P 25233/703 HAMMERSTONE
Q 25245/703 ABRADER
R 25244/703 ABRADER
S 25242/703 KNIFE
T 25243/703 STONE
U 25236/703 AWL
V 25268/703 SHERD
W 25263/703 PENDANT BLANK
NICHES
S.S. SLAB
SIPAPU
HATCH COVER
S.S. SLAB
S.S. SLAB
POT SUPPORTS
SUB-FLOOR JAR
1
2
3
4
5
6
7
8
KEY PLAN
0 1 2 3 4 5 ft
0 1 2 meters
GRAPHIC SCALES
MAGNETIC
N
14¾°

92 *Kiva E.*

93 *Overall view of Kiva E, with banquette formed by shallow alcoves.*


1229
KIVA E
AFT EX
M 8207
6.7.61

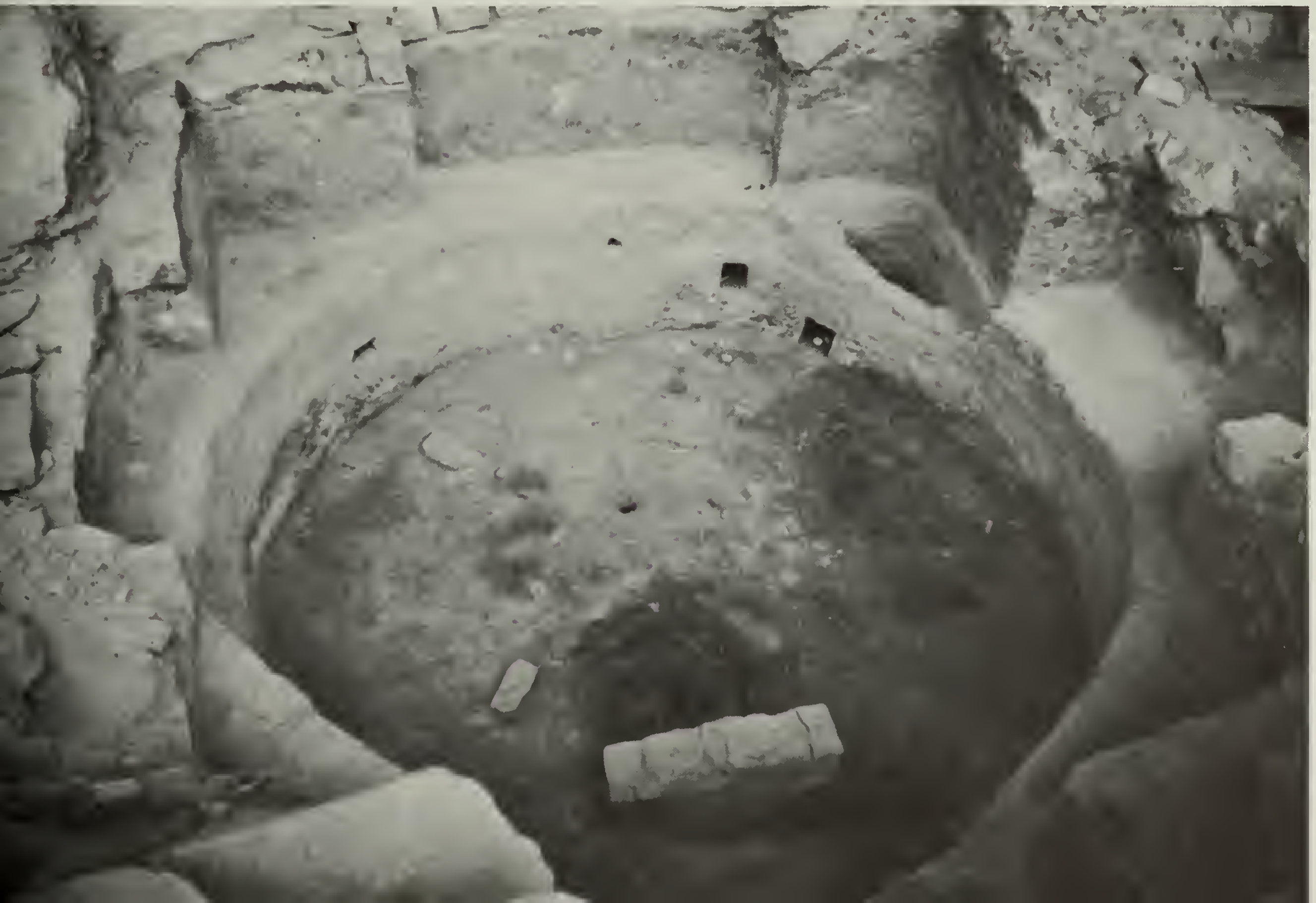


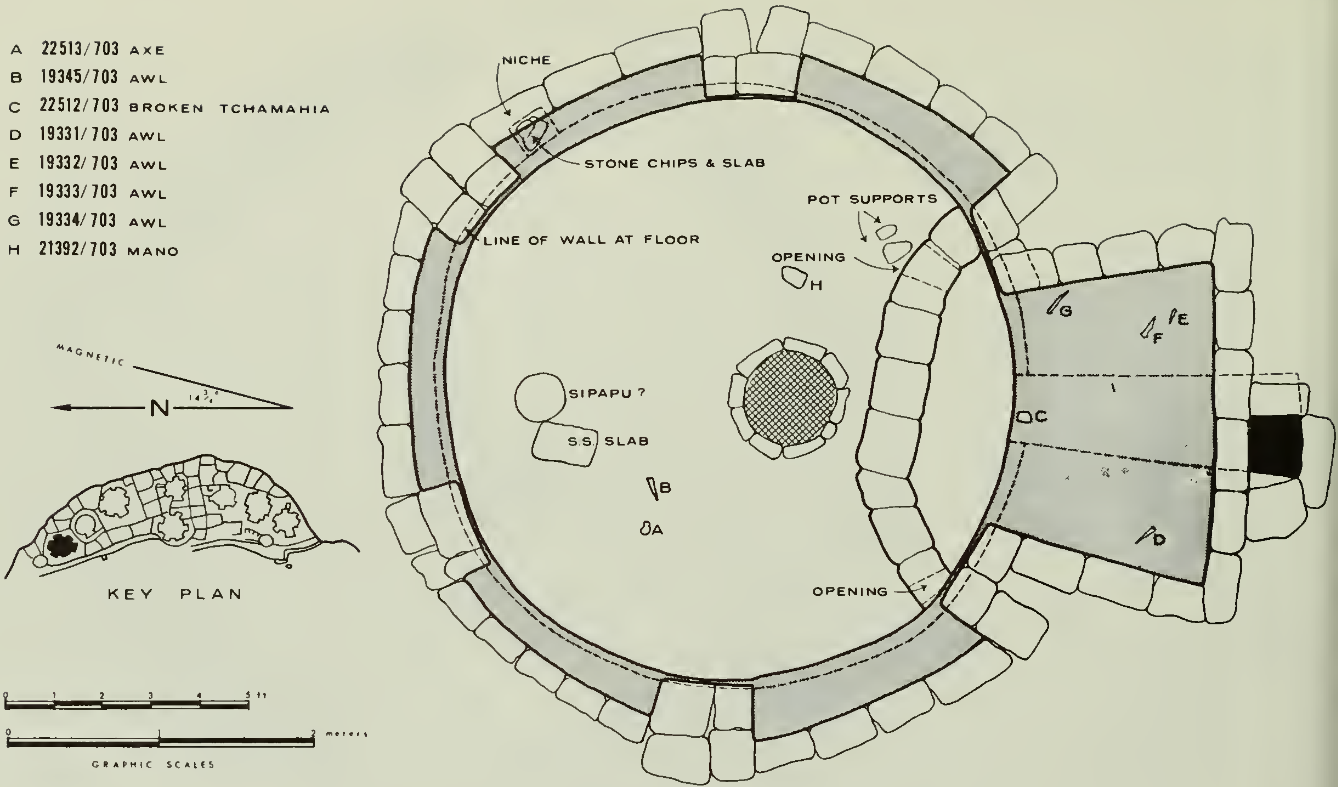
A	26230/703	SLAB
B	26219/703	MANO
C	26210/703	HAMMERSTONE
D	25120/703	RUBBING STONE
E	25116/703	FLAKE
F	25117/703	AWL
G	25118/703	ABRADER
H	26204/703	AXE
I	26205/703	GRINDING STONE
J	25123/703	DRILL
K	25125/703	HAMMERSTONE
L	25127/703	SCRAPER
M	26206/703	POL. STONE
N	25128/703	MANO
O	26207/703	AXE
P	26213/703	NEEDLE
Q	26214/703	AWL
R	26215/703	HAMMERSTONE
S	26216/703	GROOVED HAMMER
T	26217/703	HAMMERSTONE

S.S.SLAB
NICHES
1
2
3
4
SIPAPU
S.S. SLAB
POT SUPPORTS
VENTILATOR
KEY PLAN
0 1 2 3 4 5 ft
0 1 2 meters
GRAPHIC SCALES
MAGNETIC
N
14¾°

94 *Kiva F.*

95 *Overall view of Kiva F, showing circular wall built inside earlier square chamber.*



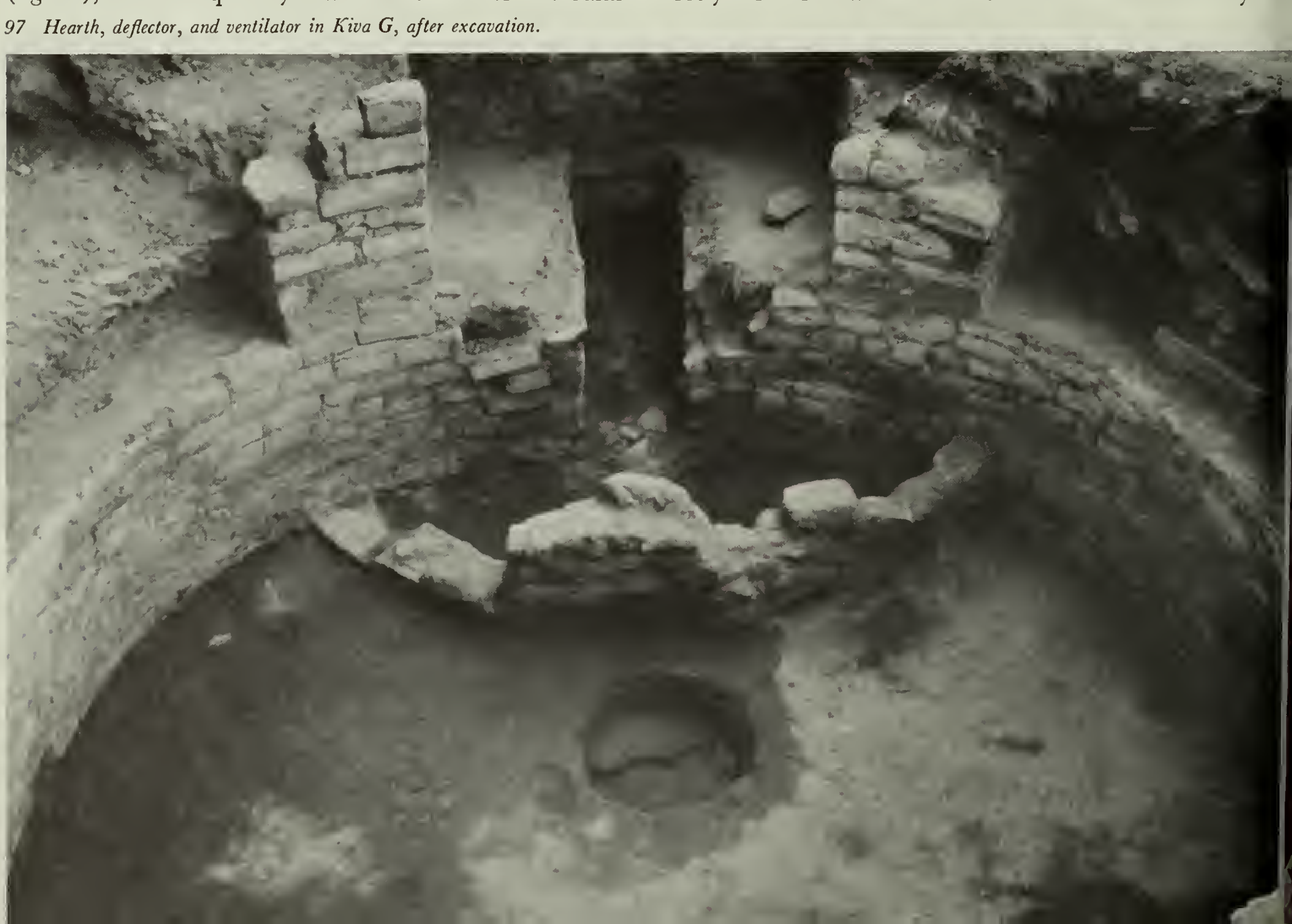

A 22513/703 AXE
B 19345/703 AWL
C 22512/703 BROKEN TCHAMAHIA
D 19331/703 AWL
E 19332/703 AWL
F 19333/703 AWL
G 19334/703 AWL
H 21392/703 MANO
MAGNETIC
N
14 3/4°
KEY PLAN
0 1 2 3 4 5 ft
0 1 2 meters
GRAPHIC SCALES
NICHE
STONE CHIPS & SLAB
POT SUPPORTS
LINE OF WALL AT FLOOR
OPENING
H
G
F
E
SIPAPU ?
S.S. SLAB
C
B
A
D
OPENING

96 Kiva G.

the floor level. The opening leading to the mouth of the jar was carefully lined with mud and covered by a circular sandstone jar lid. Nothing was found in this jar. Two wall pegs, one of Douglas-fir and the other of skunkbush, are located high above the floor in the northeast portion of the liner wall.

Kiva F

Originally this kiva was built with a square floor plan (fig. 94), but subsequently it was remodeled to a circular one about 12 feet in diameter (fig. 95). Orientation is to the northwest. The banquette is 2.6 feet above the floor. The original square outline is retained above the banquette level. In the center of each of the four straight sides is an alcove, the one toward the northwest above the ventilator being somewhat deeper than the others. The bottoms of these four alcoves, as well as the top of the new circular lining wall, form the banquette. There are no pilasters. The timbers must have stretched directly from one wall to the other. Three to five layers



97 Hearth, deflector, and ventilator in Kiva G, after excavation.

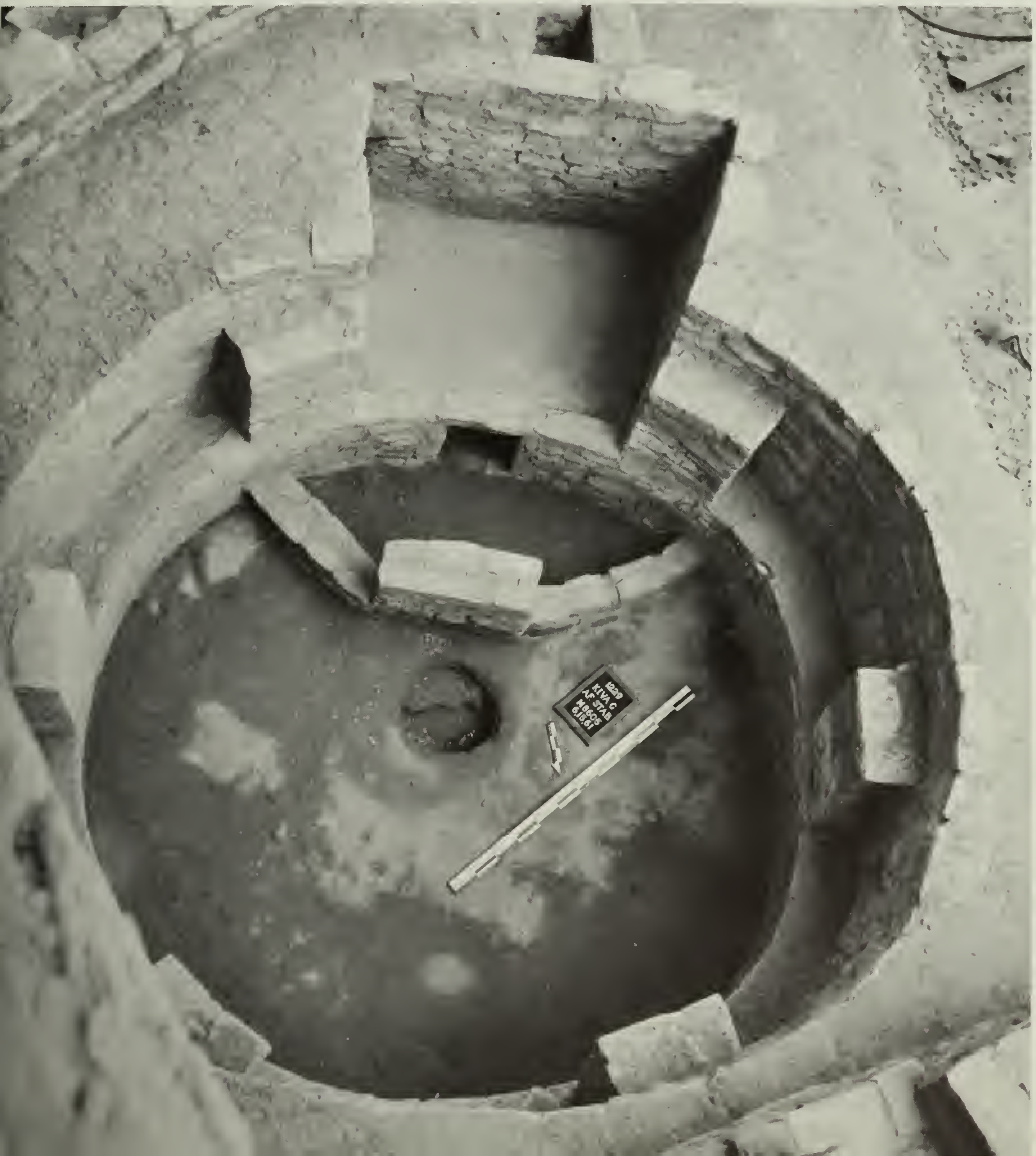
of plaster, some of them decorated, once covered the walls. All four niches are in the lower liner, the one opposite the ventilator shaft having a circular opening. One other niche passes entirely through the new circular liner wall, allowing access to one old niche in the face of the original square wall. Other features include a ventilator, a masonry deflector, a hearth containing pot supports embedded in the ashes, and a pottery jar-neck sipapu with a removable clay plug. An intriguing feature in the original square construction is a uniform 0.1-foot offset at banquette level, between the lower and upper lining walls and extending around the periphery.

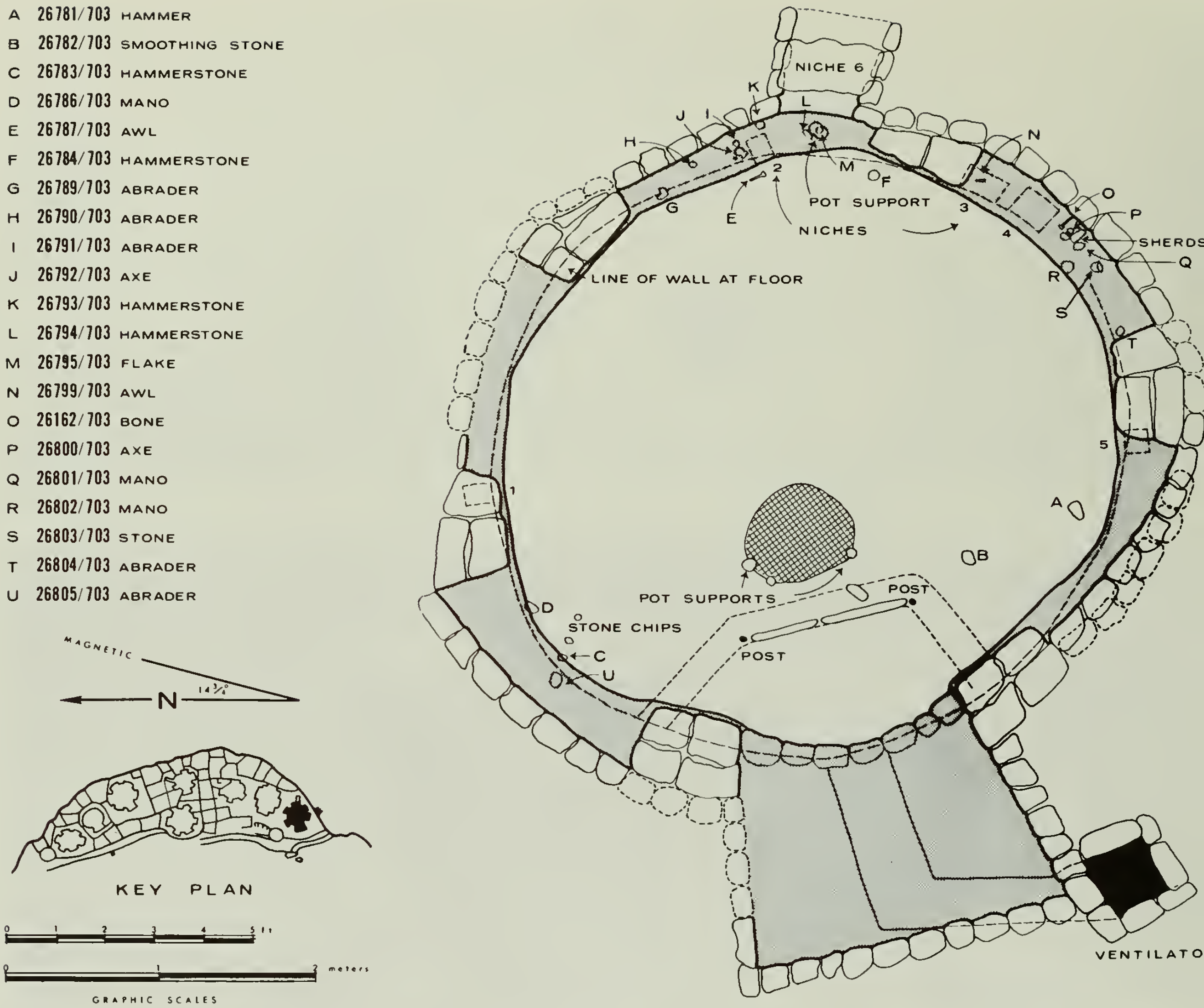
Kiva G

Circular in shape, this kiva is about 12.5 feet in diameter (figs. 96, 97, and 98). Orientation is slightly west of south. The banquette stands 2.7 to 2.8 feet above the floor, and six pilasters probably once supported a cribbed roof. Fragments can still be seen of four layers of plaster; three of them were probably decorated. There is one rectangular niche in the northeast part of the lower liner wall *not* opposite the ventilator opening. Other features include a recess, a ventilator, a masonry deflector with wingwalls connecting it to the liner wall, and a hearth. There was no definite sipapu. The large, ragged pit near the wall opposite the ventilator could have been a sipapu, possibly containing a pottery jar.

The floor of Kiva G must be near an aquifer, because it and the lower walls have been damp ever since we began excavation. Constant moisture could explain why the kiva was abandoned prior to the rest of Mug House, and may indicate a very short period of use.

98 *Overall view of Kiva G, after stabilization.*





A	26781/703	HAMMER
B	26782/703	SMOOTHING STONE
C	26783/703	HAMMERSTONE
D	26786/703	MANO
E	26787/703	AWL
F	26784/703	HAMMERSTONE
G	26789/703	ABRADER
H	26790/703	ABRADER
I	26791/703	ABRADER
J	26792/703	AXE
K	26793/703	HAMMERSTONE
L	26794/703	HAMMERSTONE
M	26795/703	FLAKE
N	26799/703	AWL
O	26162/703	BONE
P	26800/703	AXE
Q	26801/703	MANO
R	26802/703	MANO
S	26803/703	STONE
T	26804/703	ABRADER
U	26805/703	ABRADER

NICHE 6
K
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G
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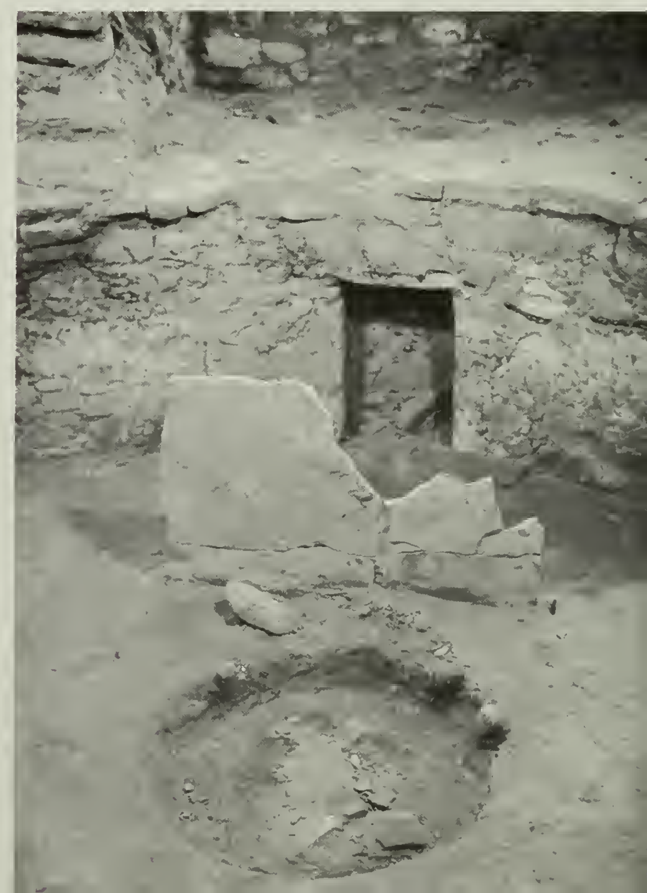
POT SUPPORT
NICHES
3
4
O
P
SHERDS
Q
R
S
LINE OF WALL AT FLOOR
T
5
1
A
B
POT SUPPORTS
POST
D
STONE CHIPS
C
POST
U
VENTILATO
MAGNETIC
N
14½°
KEY PLAN
0 1 2 3 4 5 ft
0 1 2 meters
GRAPHIC SCALES

99 *Kiva H.*

100 *Hearth, deflector, and ventilator in Kiva H.*

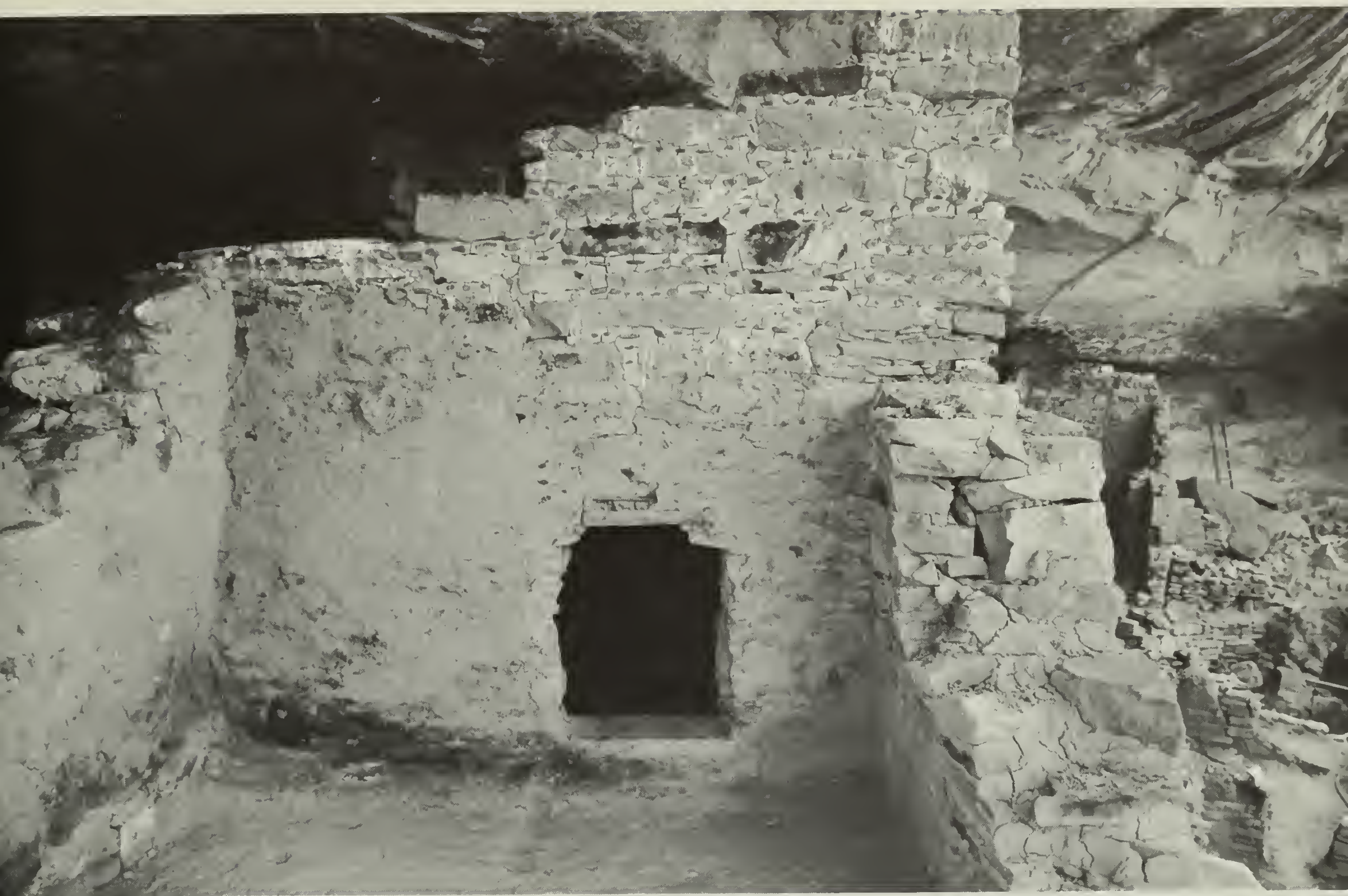


Kiva H

Roughly circular in shape, this kiva is 12.5 feet to 13 feet in diameter (fig. 99). Orientation is slightly southwest. The banquette stands 3.1 feet above the floor. Six pilasters once supported a cribbed roof. At least nine layers of wall plaster were counted; and some of these were possibly decorated. Five small, rectangular niches were located in the lower liner walls, one of them opposite the ventilator shaft. A sixth large, rectangular niche, about the size of a tunnel, opened out of the east side above banquette level. This kiva contained a recess, a ventilator angled toward the south, an upright sandstone slab deflector, a hearth, and a sipapu that had been floored over (fig. 100). Three pot supports were mudded into the collar of the hearth. One nearly complete skeleton of a desert cottontail and the long bones of another, found in the ventilator tunnel, may have had some ritual significance.

KIHU (ROOM 9)

Among the rooms on the upper ledge, Room 9 stands out from all the others in its construction and features. It was built in the once empty space between Rooms 4



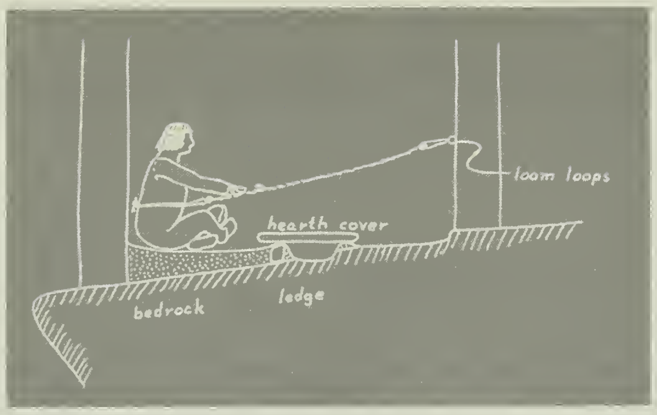
01 *Kihu* (*Room 9*).

nd 10, partially utilizing their walls (fig. 101). Only on he east and west sides and part of the north side was it ecessary to construct new walls of double-coursed nasonry, using roughly squared building blocks with ecked faces in a tan-colored mortar. Contrary to the ractice in most domestic rooms, the interior wall face vas smoother and better finished. There was no sign of hinking in the seams between the stones. There are at east two coats of pinkish-brown plaster that must have een decorated, although a set of large white triangles bout 2 feet above the floor represents all that can now e discerned. What is left of the north wall indicates that bench, about 2 feet high and 1.7 feet deep, extended cross the north side of the room. The one remaining orner is slightly rounded.

Wall features include a serviceberry wall peg about 4 feet above the floor in the northeast corner; a square iche within a foot of the floor in the center of the east vall, with small sticks set just inside the opening; sockets pparently for a pair of loom loops, 1.3 feet apart and 2.5 feet above the floor level, also in the center of the ast wall; a shelf or shallow niche in the east wall, formed y the closing of a doorway whose sill stood 3.5 feet from he floor; the stone ax-cut end of a wooden beam (whose outside ring dated A.D. 1277), projecting from the interior of the west wall near the southwest corner, about 3.5 feet above floor level; and two pairs of pecked depressions in the face of the south wall over 4 feet above the floor level, each pair separated by a bulge of clay. These last two features were added to the south wall face, possibly as decorations. Whether intended or not, the pecked depressions appear as eyes and the raised bulge resembles a nose.

A D-shaped hearth occupied a central position in the floor. An upright sandstone block formed its straight side while the curved side was clay lined over a few small sandstone slabs. A slightly raised rim encircled the finished hearth. The location of the probable loom loops in the east wall, one of which was made of skunkbush, would require a weaver at the other end of a girdle-back loom to sit with his back to the west wall, the textile extending across the hearth (fig. 102). Consequently, whenever the weaver worked, there could have been no fire; at those times the hearth was possibly covered with a sandstone slab.

Room 9 was too poorly preserved to allow a good evaluation of its entrance. A doorway opened through the south wall into Room 10, and there is evidence of a



102 Sketch showing probable position of weaver at work in kihu (Room 9).

sealed doorway in the east wall. Apparently Room 9 was separately roofed below the ceiling of the cave, so that it may also have been entered through a hatchway.

The unusual combination of features in Room 9 has prompted me to identify it as a special ceremonial chamber, or kihu (Fewkes, 1911b, p. 15). Construction details not found in domestic rooms include the better facing on the inside and the lack of chinking. In addition, the centrally located hearth, wall plaster, bench, niche, and loom loops do not occur together in any other single room. These features are found in dwelling rooms, but no one room had a combination of more than two or three. The only other centrally located hearths are in the kivas, in one of the towers, and in Room 11/1. Since this last room once possessed a separate ventilator, it too may once have functioned as a kihu, being remodeled later into an ordinary dwelling room and retaining the central hearth.

TOWERS

There has been considerable discussion about the role of towers in Mesa Verde sites. Our own cultural bias makes it easy to think of them as defensive structures, although most evidence to date favors a ceremonial purpose, probably in association with kivas. The two Mug House towers are in positions ideal for defense, but all their other attributes suggest a ceremonial significance. The south tower, Room 76, is the first structure encountered by a person entering Mug House from the south via the toeholds pecked into a large sandstone boulder. The north tower, Room 60, presents a solid masonry wall to anyone coming from the north, forcing him to traverse a 3-foot-wide path between the tower wall and a retaining wall, dropping to the trash slope below. However, there are no openings, such as loopholes, through the standing tower wall. These seemingly defensive positions may be coincidental, or the towers could have acted secondarily for defense.

In both cases, the placement of the towers clearly associates them with one or two kivas. The doorway of the north tower opens directly onto the roof of Kiva G, while the south tower stands in one of the two angles between Kivas F and H. We found no evidence of tunnels connecting one of these three kivas with a tower, although we know of no obstructions to their presence.

As in the case of Room 9, various construction details are duplicated only in the kivas. The walls of both towers were double-coursed with sandstone blocks, and 1.3 to 1.9 feet thick. The faces of most of the stone blocks, on both the interior and exterior wall surfaces, were dressed by pecking. Special footings were prepared below floor level by setting a course of rough stones into a shallow trench slightly thicker than the wall itself. Although the building stones were larger and the seams wider than in the kivas, there was no sign of chinking in either interior or exterior faces. Red-brown loess was used for mortar in the north tower and pulverized blue-gray shale for mortar in the south tower. The floor plan of the former is almost a perfect circle, 8.5 feet in diameter, while the latter appears oval, measuring 7 by 9 feet.

There is too little left of the south tower, Room 76, to determine if its walls ever stood more than one story in height, but there is no doubt that the north tower, Room 60, was at least two stories high. Room 76 had a rectangular, slab-lined hearth set against the south wall, 1.5 by 1.9 feet in size, and containing three pot supports. Room 60/1 had a pentagonal hearth lined with upright sandstone slabs rising just to the floor level and measuring about 1.7 by 1.3 feet. Other features found in Room 60/1 include a small rectangular niche in the wall opposite the doorway and the already mentioned rectangular doorway opening into Courtyard G.

Owing to their locations toward the front of the overhang, the towers were more severely damaged by rain and snow than most other structures in Mug House. None of the walls of Room 76 stood higher than 2 feet when we excavated them, and in one place even the footings were entirely destroyed. We can thank the mass of rubble from roofs and upper walls that fell against the lower walls of the north tower for protecting and preserving as much of that structure as it did.

CHAPTER 5

burials

Excavations at Mug House and neighboring Adobe Cave yielded 46 human burials (table 10). At least seven other individuals are represented among the many loose bones that could not be associated with any of the burials. Unfortunately, we have no idea how many skeletons, if any, were removed during the uncontrolled explorations in the late 19th century. We certainly did not find the remains of all or even most of the persons who lived and died at Mug House.

Of the 46 burials, 29 were encountered on the trash slope and adjacent areas of talus below the retaining walls of Mug House; 6 were found beneath rooms and between retaining walls; 1 came from the talus slope halfway to Adobe Cave; and 10 were found in Adobe Cave. Early in our excavation program we realized that burials would be located outside the bounds of where we intended to excavate, so we spot-tested along the talus, both north and south of the trash dump. Our early efforts were quickly rewarded with the discovery of five burials beyond the boundaries of excavation. Subsequent testing failed to produce any further results. No doubt there are other burials scattered about that a more intensive exploration might uncover. Our spot-testing covered only a few of the more obvious prospects and was limited to the upper talus slope.

All but two of the graves fall into three main locational groups (fig. 15). Eighteen burials were found beneath the buildings and retaining walls in the southern one-third of Mug House cave and in the trash dump immediately adjacent to this section. A second group of 16 was somewhat dispersed throughout the lower reaches of the trash slope, in its northern part, and in the adjoining talus slope. The third group of 10 came from the excavated sections of Adobe Cave.

The two burials that did not fit into one of the three groups were found 4.3 feet beneath the floor of Room 37/1 and about midway between Mug House and Adobe Cave (fig. 103). These belong to Component A.

103 Burial M21.

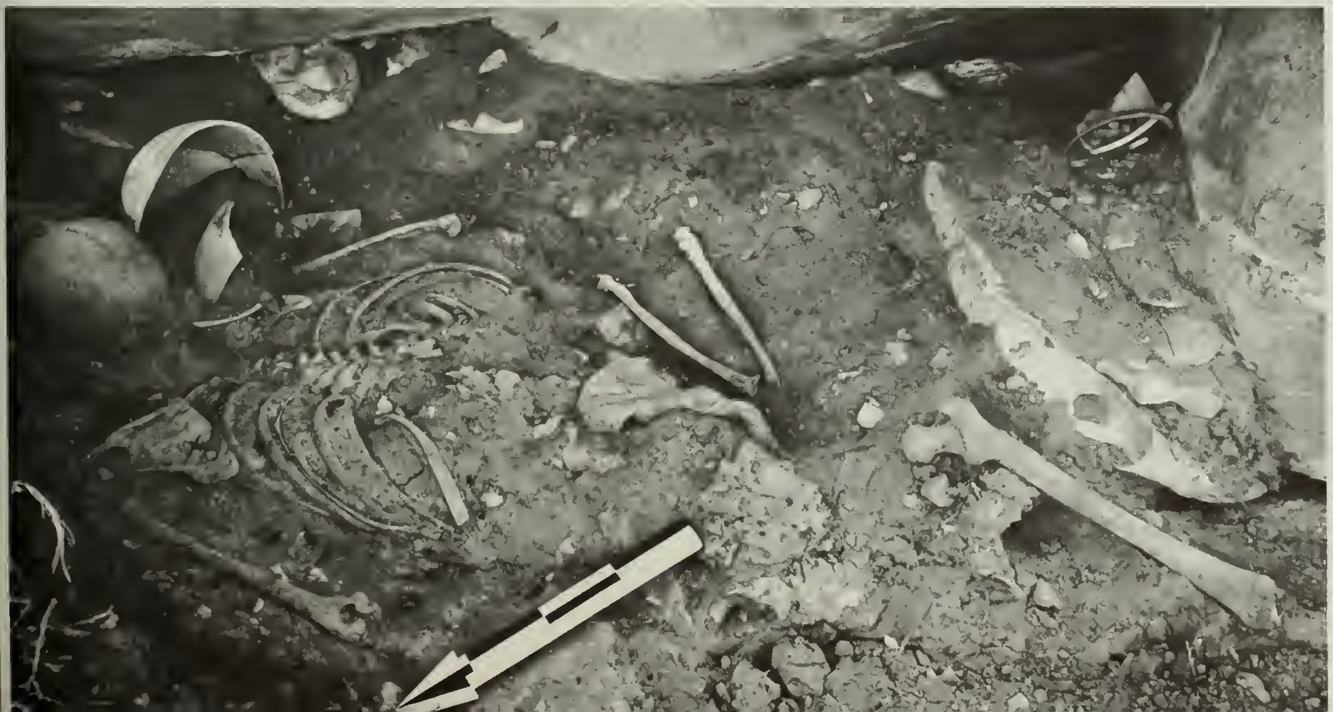


TABLE 10.—MUG HOUSE AND ADOBE CAVE BURIALS

Burial	Sex	Age	Attitude	Position	Deformation	Accompaniments
M1	♂	Adult (old)	Flexed	Right side	Lambdoidal centered.	B/W mug, corrug. jar, wooden pillow, parts of feather/fur robe, parts of willow mat.
M2	♂	do	Head only	do	do	Feather robe, willow mat.
M3	♀	20–22	Flexed	do	Occipital centered	Parts of feather/fur robe.
M4	?	2	do	do	Occipital left	Parts of feather robe.
M5	♀	29±3	do	do	Lambdoidal right	2 B/W bowls, small corrug. jar, curved wooden stick.
M6	♂	33±3	do	Back	do	2 B/W bowls, B/W mug, small corrug. jar, pendant blank, 2 cylindrical paint stones, 4 side-notched arrow points, polishing stone, 2 pieces oblong petrified wood, 12 pebbles.
M7	♂	Adult	?	?		None.
M8	?	2–3	?	Back		Do.
M9	?	1–1½	Semiflexed	Right side		Do.
M10	?	2–4	?	?		Do.
M11	?	1 or under	?	Face down	Occipital left	Miniature bowl.
M12	♂?	11±1	?	?		None.
M13	?	Fetus or neonatus.	Semiflexed	Left side	None	Do.
M14	?	1½–2	?	do	Occipital centered	Do.
M15	♀	43±3	Flexed	do		Do.
M16	♂	40±10	?	Back		Do.
M17	?	Adult	?	?		Do.
M18	♂	27±2	Extended	Face down		Do.
M19	?	2–3	Flexed	Back	Occipital centered	B/W mug.
M20	?	¼–½	?	do	do	None.
M21	♀	21±1	Extended	Face down	Lambdoidal	2 B/W bowls.
M22	♂	36±4	Semiflexed	Back		None.
M23	?	0–¼	do	do		Do.
M24	?	3–4	do	do		Do.
M25	♂	36±4	Flexed	do	Occipital right	Do.
M26	?	1½–3	?	do		Do.
M27	♂	24±2	Flexed	do	Lambdoidal	Bone bead.
M28	?	0–¼	Semiflexed	do	None	Stone arrow point, stone chip.
M29	?	14±2	?	Left side		None.
M30	♂	43±3	Flexed	Face down	Lambdoidal	B/W bowl, grinding stone.
M31	♂	45±5	Semiflexed	Right side	do	B/W mug, 2 stone axes, 7 bone awls and weaving tools.
M32	?	1½–2	?	Left side		None.
M33	?	2–4	Semiflexed	Right side		Do.
M34	?	8–9	do	Back	Lambdoidal	Do.
M35	?	2–3	do	Left side	Lambdoidal centered.	Stone scraper.
M36	?	Infant	?	?		Parts of willow mat.
M37	?	5–6	?	?		Miniature bowl, 2 or 3 stone chips.
M38	?	Infant	?	?		None.
M39	?	1¼–1¾	Flexed	Left side	Lambdoidal centered.	Do.
M40	?	2–4	?	?		Do.
M41	?	2½–3½	Semiflexed	Back		Do.
M42	?	1½–2	Flexed	Face down		B/W mug, worked stick, 2 snail shells.
M43	♂	30–35	Extended	do	Lambdoidal	None.
M44	♀	3–4	Flexed	Right side	do	Sandstone concretions.
M45	♀	3–4	Semiflexed	do	do	None.
M46	♂	30–35	Flexed	do	do	Do.

Most of the individuals in the south Mug House cave group seem to have been interred earlier than those in the lower trash slope group. The older buildings of Mug House occupied the northern part of the cave, leaving the southern part available for burials. Later construction filled this section and covered many of the old graves with buildings and rubbish. Once the entire shelter was filled, graves were apparently dug farther down the slope. Two of the burials in the south Mug House cave group, M24 and M31, belong to Component B.

The dead were placed in shallow, oval pits, barely large enough to hold them, scooped out of soft refuse or talus (figs. 104, 108, and 113). The maximum depth of 11 measurable graves ranged between 1 and 2 feet, with one possibly extending down slightly more than 3 feet. On the slope, natural cavities under large boulders (fig. 110), or narrow crevices between boulders (fig. 105), were frequently chosen. Placing a grave on a steeply sloping talus or trash slope exposed the burial to erosion and slope movement. Consequently, where large boulders or bedrock ledges were not available to help shelter it, the grave was sometimes lined on its downslope side with sandstone slabs and spalls or, in the case of Burial M6, with large sherds of a black-on-white bowl. The need for protection may explain why eight bodies (Burials M5, M6, M15, M17, M18, M19, M27, and M31), most of them on the lower slope, were covered with large blocks of sandstone (figs. 104a and 106a).

Most graves contained only a single body, but four may possibly have held both an older person and an infant. An 11-year-old boy (M12) and a possible stillborn baby (M13) were both buried in what was once Room 54, beneath a large sandstone boulder. Prior to the closing of this cavity by gradually accumulating refuse, some animal (or person) thoroughly disturbed the boy's body, scattering his bones over a wide area. Just north of the trash slope, an 18- to 24-month-old infant (M14) was laid close to the body of a 43-year-old woman (M15), if not placed in the same grave. This situation is almost exactly repeated in the south Mug House cave group where a 36-year-old woman (M22) and a baby no more than 3 months old (M23) lay side by side. In both cases, the women were old enough to have been grandmothers of the infants, although neither had outlived her capacity for bearing children. In the fourth instance, a baby, no older than 3 months old (M28), rested directly on top of a 24-year-old man (fig. 107).

Age and Sex

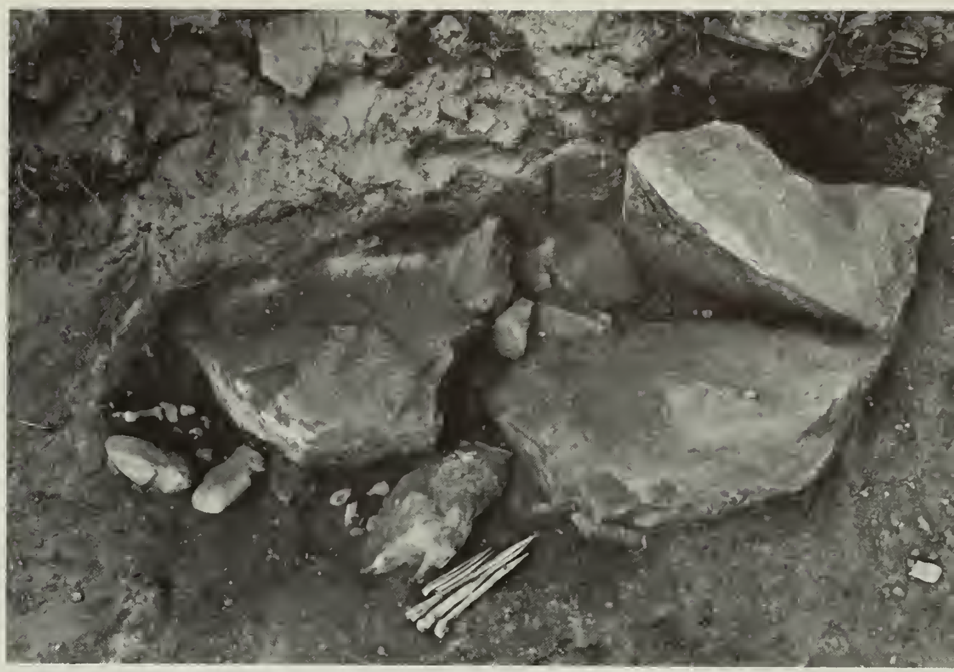
Estimated age at time of death places the 46 skeletons in the following groups:

0 to 4 years—24 individuals
5 to 15 years—4 individuals
20 to 25 years—3 individuals
27 years +—13 individuals
Miscellaneous adults—2 individuals

It is obvious that the first 4 years of life represented the most critical period. Once a Mugueno reached adulthood, he could expect an average lifespan of approximately 34 years. Apparently no one in this sample lived beyond the age of 50.

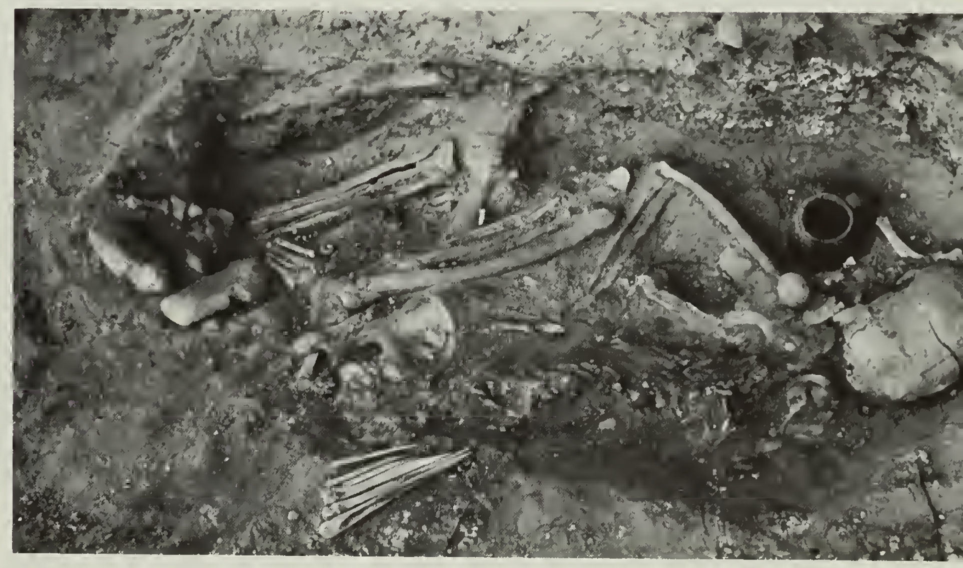
With the infant mortality rate during the first 4 years exceeding 50 percent, and with only a short period of reproductivity for each adult, the birth rate must have been quite high in order to maintain the population at all. Childbirth may also have threatened mothers, since two of the three burials in the 20- to 25-age-group were women. We can further suppose that parents were hardened to the fact that every other baby born to them would die in infancy.

It might be argued that our small sample is weighted in favor of infants and small children who may have been buried nearer home than were adults. However, virtually identical proportions of age groups were found in each of the three groups of burials. But we do have an imbalance

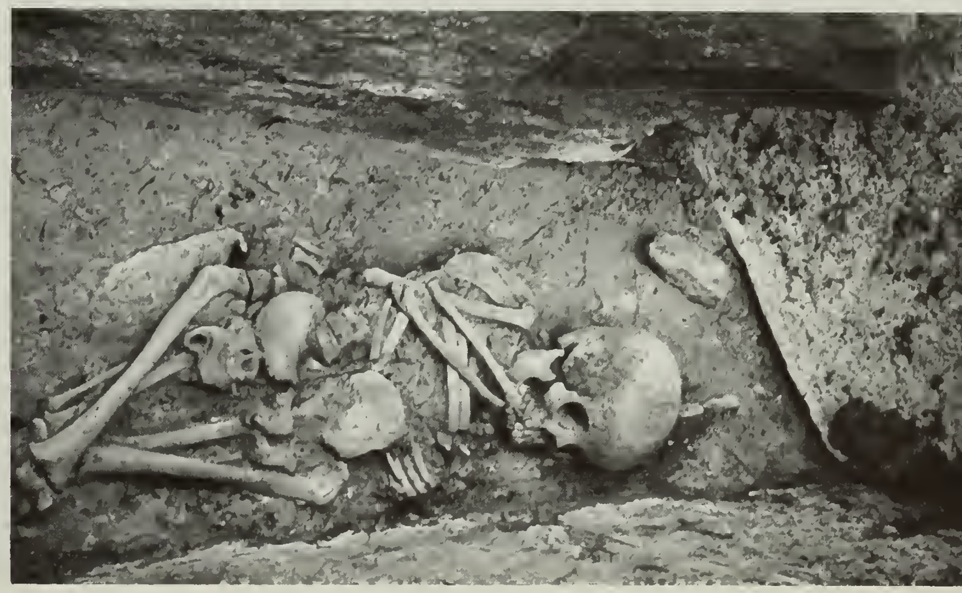


104 Burial M31. a, Rocks covering burial

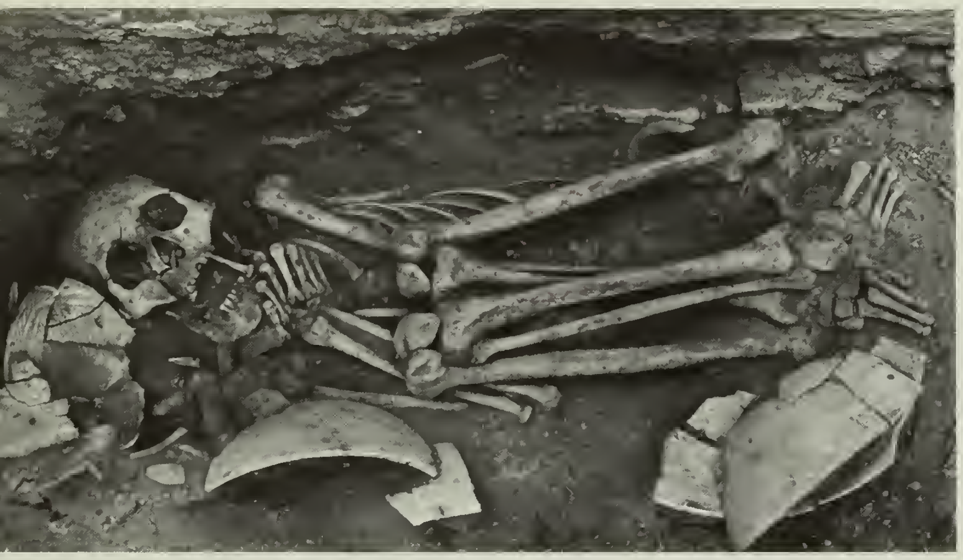
b, rocks removed from burial.



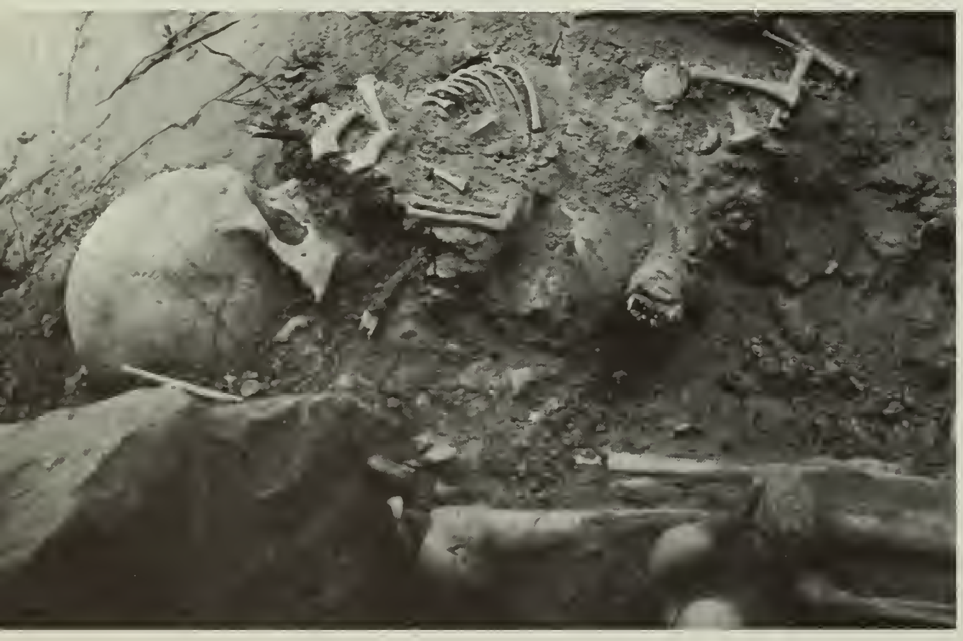
105 Burial M34.



106 Burial M6. Rocks covering burial; and (below) burial with rocks removed.



107 Burial M27, with infant above adult male.



between the sexes of adults, represented by 12 males and 5 females. It is possible that women were customarily buried in places different from those we found, or previous excavators may have removed a disproportionate number of women.

Body Attitude

A considerable variety in positions of burials suggests that little formality was attached to placing an individual in his grave. The vast majority were either flexed, with the knees drawn up under the chin and the heels at the buttocks (figs. 108 and 109), or semiflexed, with the knees pointing out at right angles to the body and feet drawn toward the buttocks (fig. 110). Some were found on their right side, some on their left side, some on their back, and a few face down. We found three fully extended on their stomachs (fig. 111). There do seem to be relationships between body attitude, age and sex, and place of burial, although it is quite true that none of these are without exception.

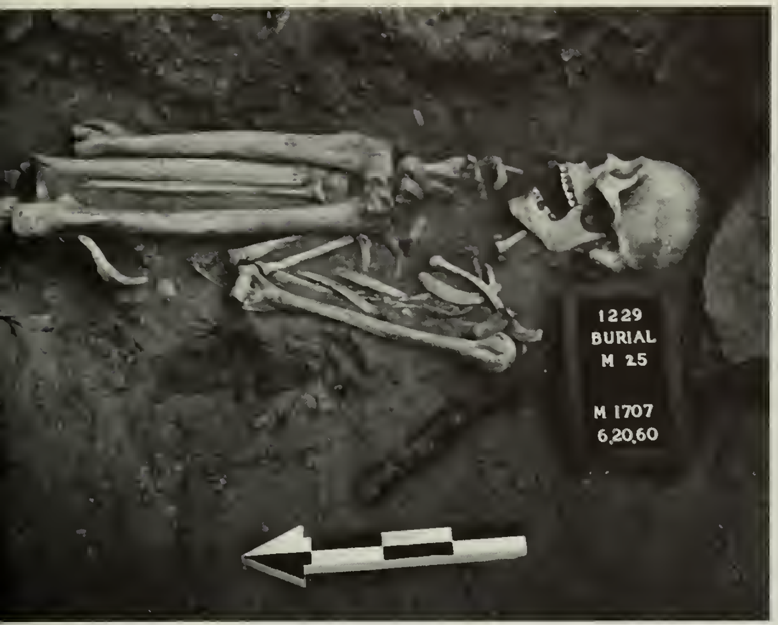
The extended burials were adults—two men and one woman. They show no correlation with any one locational group or with any one component in Mug House.

Subadults—that is, persons under 18 years of age—and especially infants and young children were semiflexed twice as often as they were tightly flexed. They usually rested on their backs, although several were placed on either side and two were face down. Adults were more often tightly flexed and rested on their back or right side. We found only one female adult on her left side and one flexed male face down (fig. 112).

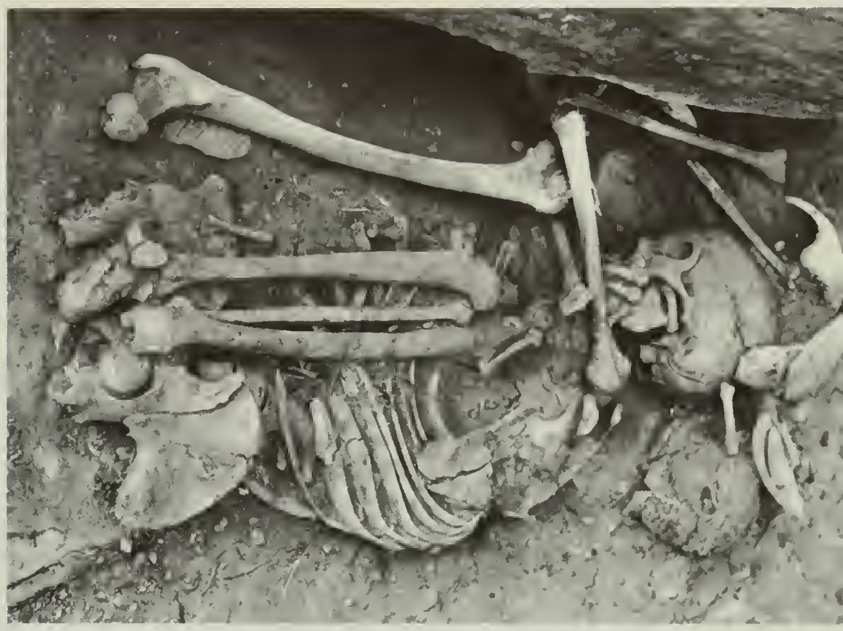
Nine of the 14 flexed burials were adults, while 10 of the 12 semiflexed burials were subadults. The 11 bodies on their right side were nearly equally divided between adults and subadults. Of the seven bodies placed on their left side, only one was an adult. Subadults account for 9 of the 14 persons placed on their back but for only 2 of the 6 placed face down.

Adobe Cave burials show the most consistency in body attitude. Seven skeletons were resting on their right side (fig. 113), one was on its back, and two were face down. Six were tightly flexed, two were semiflexed, and one was extended. In the group from the south end of Mug House cave, seven were semiflexed while only four were tightly flexed. Eight of this group lay on their back, four on their left side, one on the right side, and one face down. The lower trash slope group contained four tightly flexed, two semiflexed, and one extended, while five individuals lay on their back, three on their left side, two on their right side, and two face down.

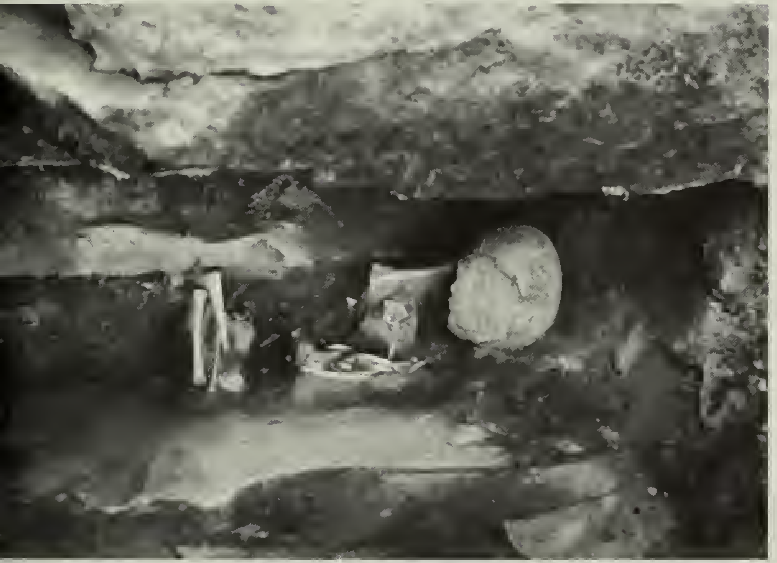
Six of the 14 flexed burials came from Adobe Cave, while the remainder were equally divided between the groups from the lower trash slope and the south end of Mug House cave. Seven of the 12 semiflexed bodies came from the south Mug House cave group with 2 each from the lower trash slope and Adobe Cave. Of those persons resting on their right side, seven were in Adobe Cave, two on the lower trash slope, and only one in the south end of Mug House cave. Four of the seven burials resting on their left side were also found in the


1229
BURIAL
M 25
M 1707
6.20.60

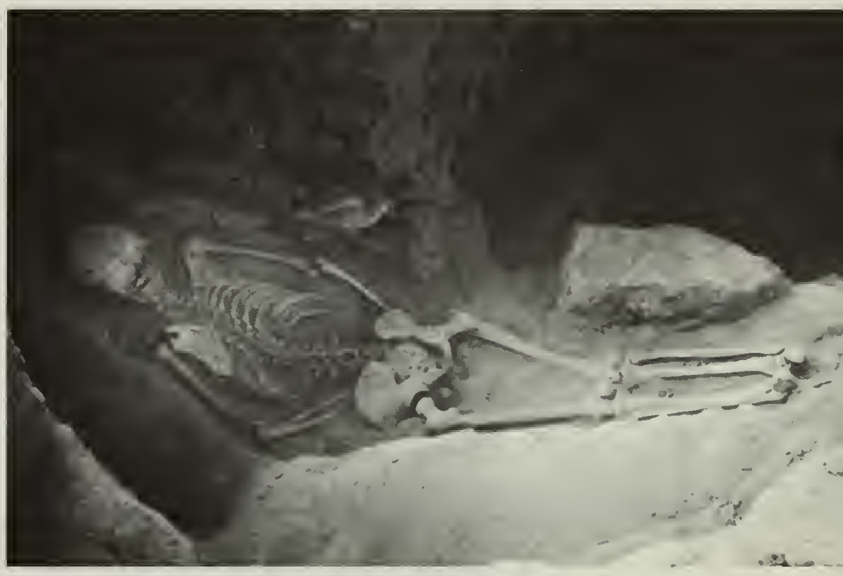
108 Burial M25.



109 Burial M5.

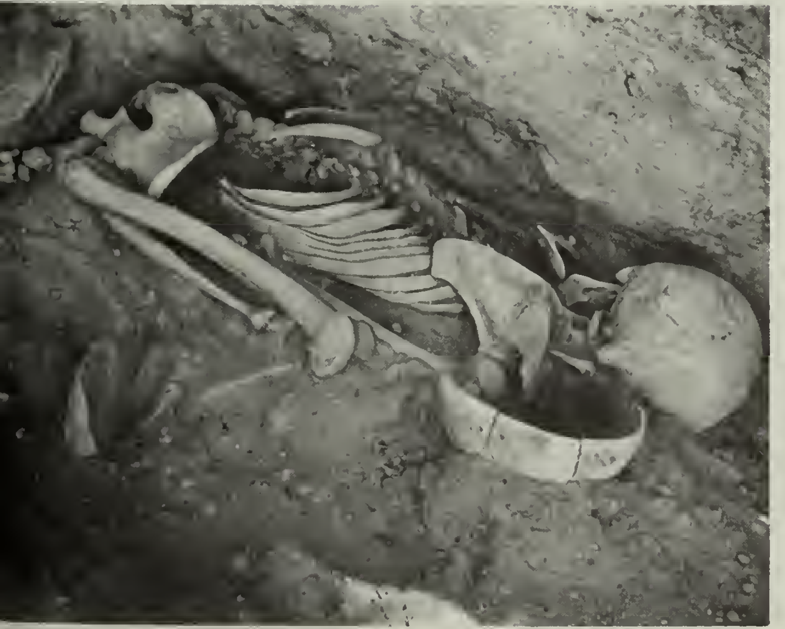


110 Burial M9.

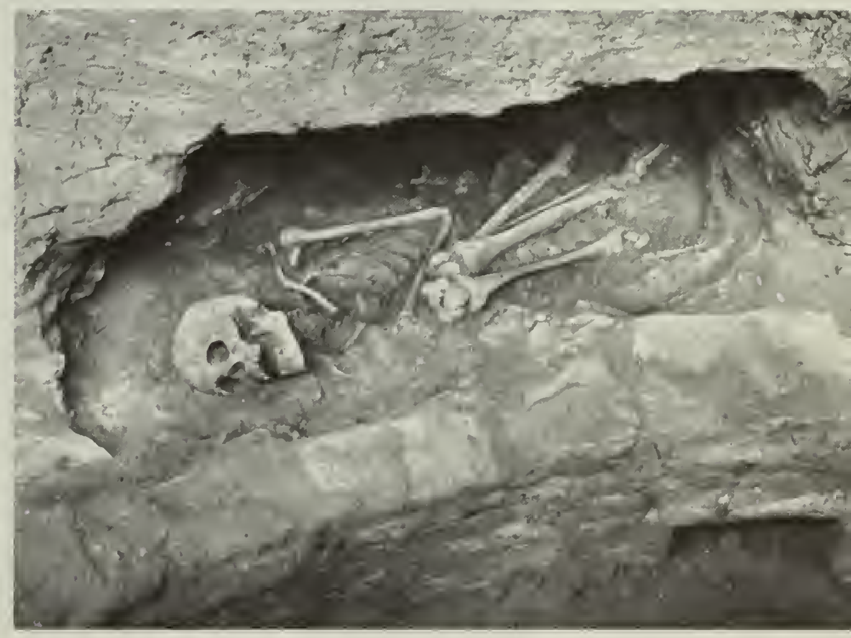


111 Burial M43, in Adobe Cave.

112 Burial M30.



113 Burial M46, in Adobe Cave.



last location, with three others found in the lower trash slope. Eight of the 14 people on their back were found in the south Mug House cave group, 5 in the lower trash slope, and 1 in Adobe Cave. Those bodies that were found in a face-down position were equally divided among all three locational groups.

What all this means is hard to say. I have already pointed out that there seems to be no correlation between age groups and sex and where the body was buried. Although there is some correlation between age group and body attitude, this seems to be weaker than the relationship of attitude and grave location. Is it possible that funerary customs varied more between social or kin groupings than they did for the age of the person to be laid away? For example, if one kinship unit customarily buried their dead in Adobe Cave, did they prefer a tightly flexed position resting on the right side, while another group who buried most of their dead in the south end of Mug House cave preferred the semi-flexed position on the back or left side? A chronological shift in custom does not seem as likely, since the two groups that may differ somewhat in time of interment—that is, the south Mug House cave group and the lower slope group—are much more like one another than either is like the group from Adobe Cave. Furthermore, the four burials that can be assigned to the two earlier components of Mug House show no consistent trend toward any specific attitude.

Whatever the burial customs might have been, they must have allowed considerable variability. We found no consistent orientation of the head to a cardinal direction or to the slope. On the slopes, the body normally paralleled the contour, probably to make digging the grave easier, but there were enough exceptions to indicate no special considerations beyond the practical one.

Burial Accompaniments

Only 18 burials contained grave goods, and four of these held only remnants of body wrappings. It is likely that each corpse was wrapped in a feather robe and a willow mat when interred, since fragments of these items were found in all of the burials where perishables were preserved. True grave offerings were present in less than one-third of all graves, and most consisted of very minor objects. Nothing at all was found in the graves of 9 adults and 19 subadults.

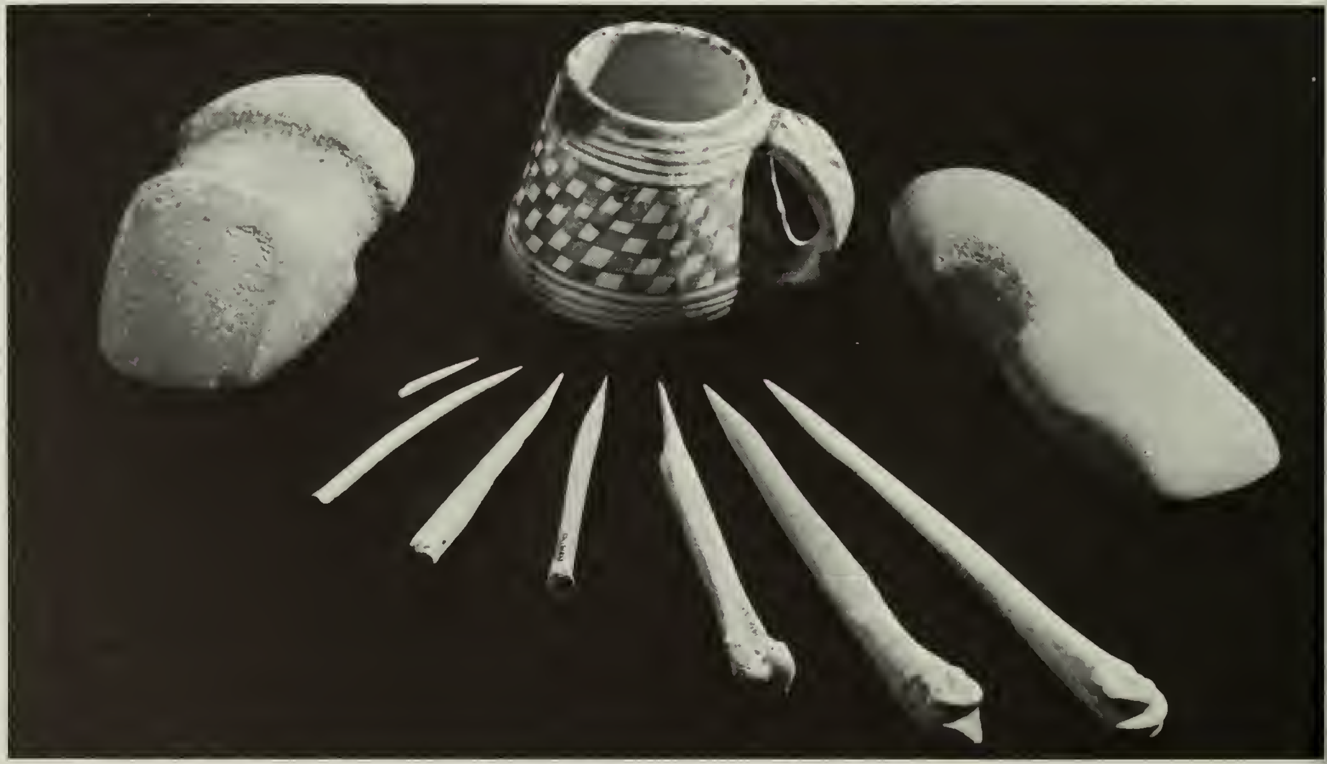
Although grave goods are extremely scarce, adults were distinctly favored over the subadults in this respect. The 14 burials containing offerings were equally divided between the two categories, but this represents 39 percent of the adults and only 25 percent of the subadults. Furthermore, the adult burials contained by far the richer or more elaborate offerings.

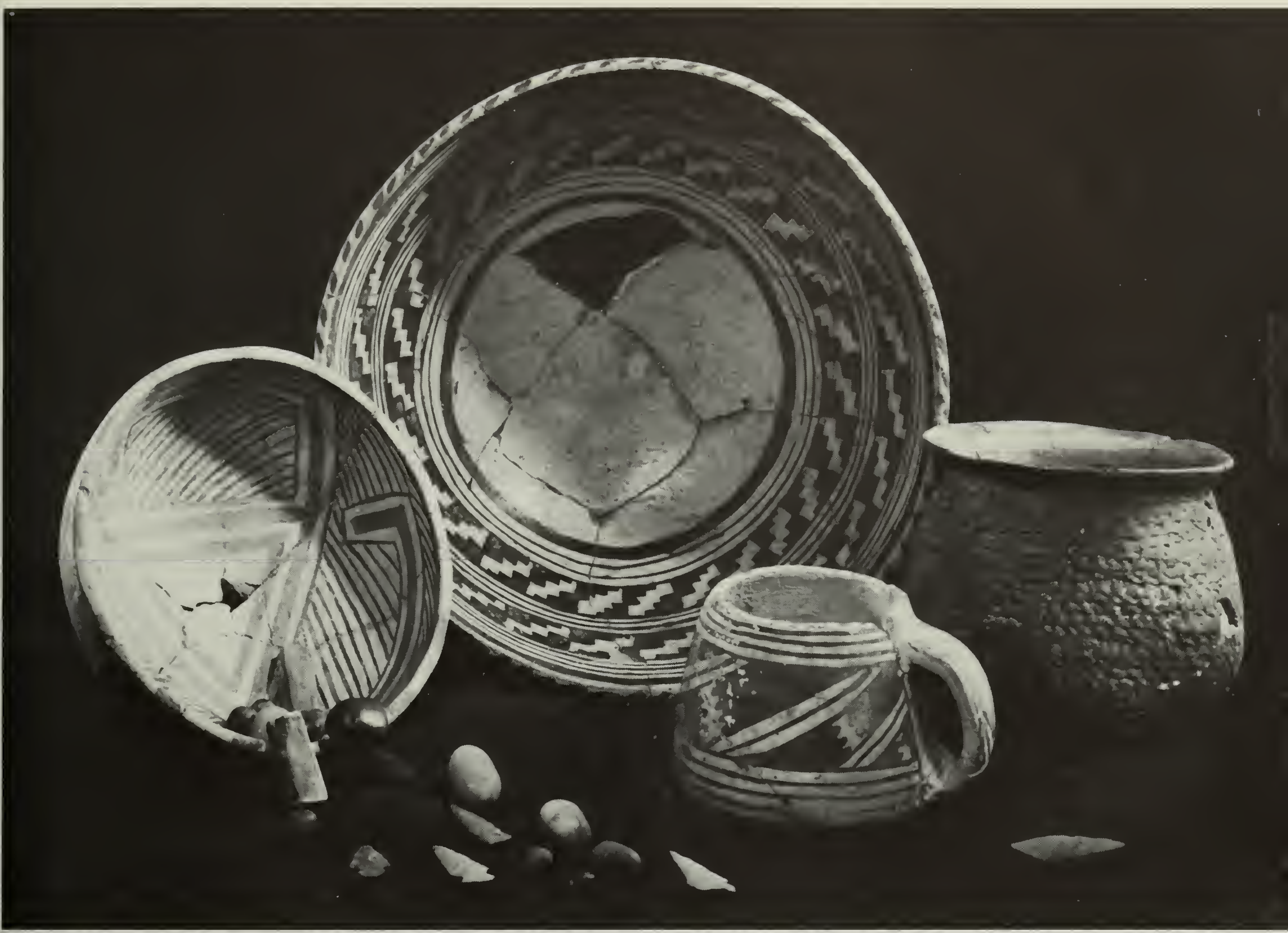
Each of five infant burials held scanty mementoes: respectively, a concretion, a stone scraper, an arrowhead and a stone chip, a miniature clay bowl, and a miniature clay bowl with several stone chips. Of the other two infant burials, one contained a black-on-white mug, the other a black-on-white mug with a worked stick and two small snail shells.

Pottery vessels formed part of the offerings in six of the seven adult burials and were the sole items in the two adult female burials. The curved wooden stick in Burial M5 could have been either a throwing stick or a support for the sandstone blocks covering the body (fig. 109). One man (without any pottery) had a tubular bone bead at the back of his head—probably worn in his hair. The offerings of the other four male burials deserve separate mention.

Burial M30 had a black-on-white bowl and a grinding stone (fig. 112). Burial M1 had a black-on-white mug,

114 Grave offerings found with Burial M31.





115 Grave offerings found with Burial M6.

a small corrugated jar, and a wooden pillow. Burial M31 was accompanied by a black-on-white mug, two stone axes—one full-grooved and one side-notched—and a kit of one bone reamer and six bone awls, one of which has a transverse groove (fig. 114).

The most interesting, as well as the most elaborate, offerings were found with Burial M6 (fig. 115). The large sherds of a black-on-white bowl helped to line the downslope side of the grave, while a small corrugated jar, a black-on-white mug, and a small black-on-white bowl rested along the right side of the head. Inside the small bowl were 16 small stone objects that may once have formed part of a medicine man's "kit." This kit included two cylindrical paint stones; two rubbed amorphous chunks of hematite that were also paint stones; four side-notched arrow points found side by side, as if they had been bundled, and each bearing an unusual feature of manufacture; two well-ground, oblong pieces of petrified wood; and six pebbles. Elsewhere in the grave were a red shale pendant blank, a lump of very heavy mineral, and four more small pebbles. Each of these items may have had some specific value or power in the hands of this man, who had apparently owned them during his lifetime.

Three kinds of pottery vessels—mugs, bowls, and jars—were found with burials. Black-on-white mugs occurred with two infants and three adult males. Black-on-white bowls were found with two adult males (one each) and with two adult females (two each). Small corrugated jars occurred with two adult males and one adult female, together with a mug, bowls, or both. These vessels may once have held food and water to nourish the spirit on its journey to the afterworld.

Physical Characteristics

What little evidence of external appearance we have indicates that the Muguenos belonged to the race of present-day American Indians. They had straight black hair (numerous hairs were recovered), a concavo-convex nasal profile, and prominent cheekbones that tend to make the face appear broad in relation to its length. They were relatively short: 10 men ranged between 155 cm. (5 feet 1 inch) and 173 cm. (5 feet 8 inches) and averaged 165 cm. (5 feet 5 inches); and 4 women ranged between 153 cm. (5 feet) and 159 cm. (5 feet 2½ inches) and averaged 157 cm. (5 feet 2 inches).

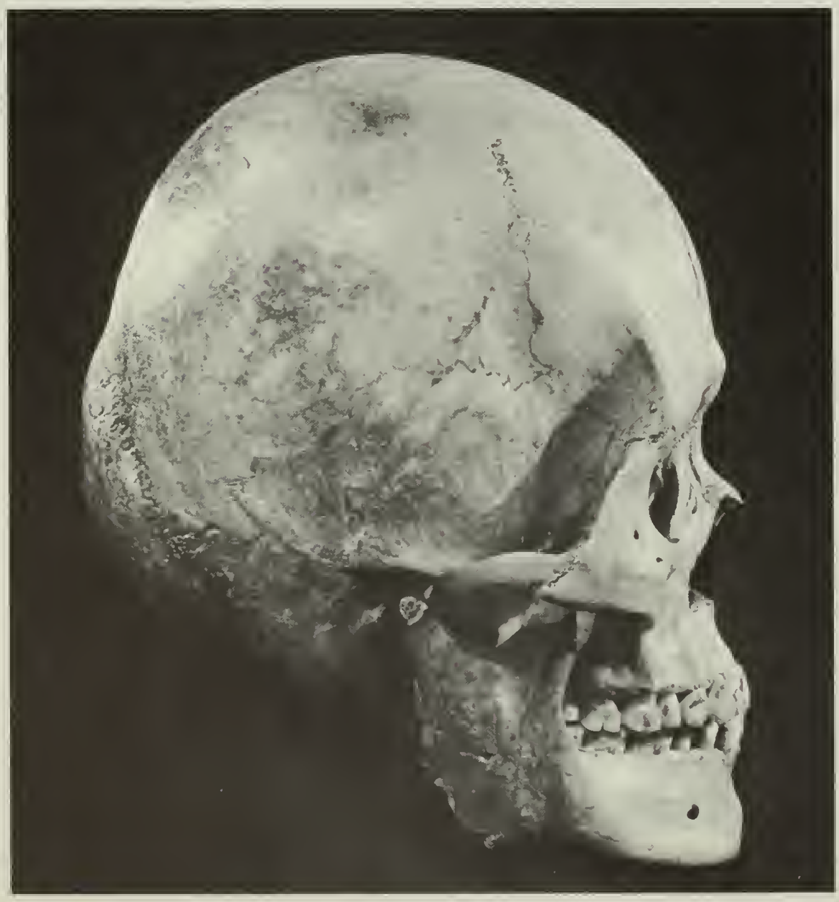
Undoubtedly, the loss of numerous teeth produced many a toothless smile as the people grew older. Even those teeth that remained became increasingly worn down from the gritty, daily fare prepared on the sandstone metates. Thus you could almost tell the age of the prehistoric Puebloan by looking in his mouth.

The long bones in their legs show signs of well-developed musculature, probably due to walking up and down the cliffs and slopes around Mug House.

A conspicuous physical feature would be the round shape of the head when viewed from above. This was not an inherited trait; rather, it resulted from constant pressure in one spot by a hard pillow or cradleboard. If the newborn infant were firmly bound to the cradleboard with his head pressing against a hard surface, the back of the head would tend to be flattened. It is not difficult to imagine that in a location such as Mug House infants would not be given much freedom to crawl around or explore the precipitous terrain.

All of the skulls of adults and children, and even infants who had lived only a few months, showed this deformation (fig. 116). In some instances, the flattening is in a vertical plane (occipital deformation), but in most cases it lies farther toward the top of the head at an angle (lambdoidal deformation). Most of the flattening is quite symmetrical, but there are a number of cases where it is asymmetrical, either to the right or to the left. As evidence that this trait was acquired during life, there are two skulls in the Mug House collection, one of a stillborn baby and the other of an infant who may have lived only a few weeks, that show no signs of flattening, but appear to be rather long and narrow.

116 Artificial flattening of back of skull, Burial M27.



Two other characteristics may be inferred from the bones. In seven of the eight skeletons on which observations were made, the bones of the right arm show greater development, possibly as a result of righthandedness. The eighth individual, a man, has greater development in his left arm. The second feature is a small worn spot found on the talus, or ankle bone, thought to be formed from contact with the lower end of the tibia when a person squats. The "squatting facets" were observed on 16 of 19 adult tali, or 84 percent. Knowing how little headroom there was in most of the dwellings and storerooms, it is safe to assume that the occupants of these rooms spent a good deal of time in a squatting position.

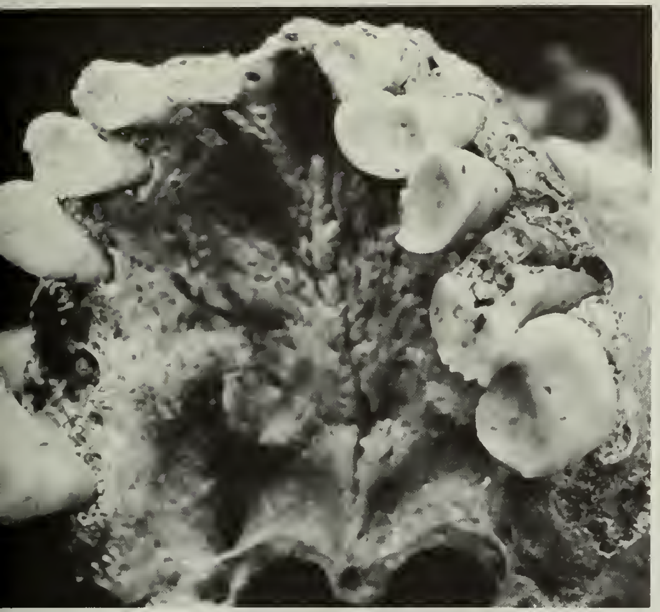
Pathology

Dr. James S. Miles has recognized in the human bones a number of ailments that plagued the Muguenos. Most noteworthy is the nearly universal appearance of degenerative arthritis in mature adults. All but one (Burial M31) of the skeletons judged to be 29 years of age or older showed signs of this crippling disease, particularly along the spinal column, but also occasionally in the fingers, elbows, shoulders, hips, and in the glenoid fossa where the lower jaw hinges with the base of the skull. Two women under 29 (M3 and M21) also showed arthritic changes. Dr. Miles suggests that these people may have tended to "wear out" at a relatively early age, possibly because they led a strenuous life.

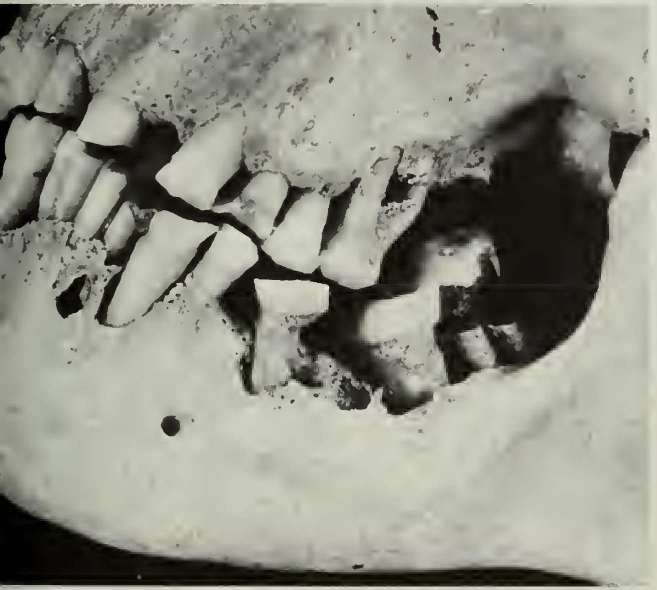
Several skeletons exhibited healed or partly healed fractures. Most common were compression fractures in vertebrae (Burials M6, M21, and M30). One man (M30) had a broken collarbone and rib in addition to compression fractures of two thoracic vertebrae. Another man (M6) merely had a broken finger. A child (M4) showed three completely healed rib fractures. Breaks such as these could result from minor falls or accidents; none of them definitely indicate falls from the high cliffs.

From an orthopedic standpoint, the most unusual features are the neural arch defects seen in the vertebrae of two men (M27 and M46) and one woman (M5) from Mug House and Adobe Cave. Each represents a different stage in the development of complete bilateral spondylolysis (the breaking down of the neural arch of the vertebra) and the appearance of spondylolisthesis (the forward dislocation of the lower lumbar vertebrae). Such a condition would produce a chronic ache in the small of the back with variable degrees of disability. Other afflictions included osteochondritis dessecans—inflammation of the bone—on the distal femoral condyle of a man in his early 30's (M46) and a bone tumor in the wrist of an old man (M30).

Quite a few Muguenos were born with structural anomalies. A young man (M27) had an extra rib on his lower left side. A child (M41) had six lumbar vetebrae instead of the usual five, and the left coronal suture of its skull had begun to close prematurely. Bipartite patellae,



117 Decay, tartar, and attrition in maxillary teeth, Burial M43.



118 Caries and evidence of pyorrhea, Burial M46.

normally a one-piece bone, were found in two men (M1 and M43), both from Adobe Cave. In the latter individual, both first ribs had fused to the sternum. One male (M46) had an accessory ossification center in one of his foot bones, the cuboid. The two femoral necks—that is, the parts of the thigh bones immediately below the hip joint—of one infant (M38) were twisted unusually far forward. The "medicine man" (M6) had a stiff little finger, with all three phalanges fused into one bone. Atypical characters were also noted in the vertebral arches in the necks of two males (M12 and M30) and among the miscellaneous human bones that could not be assigned to specific burials. As a result of abnormal growth, one elderly man (M1) and one elderly woman (M15) exhibited a twisting outward of the lower ends of their tibiae (lower leg bones) from 25° to 35°. These people would have walked like Charlie Chaplin.

If Mug House society had included any full-time specialists, one of them should have been a dentist. He would have had a wide range of defects to work on. The following discussion of dentition is based on observations made by Dr. E. H. Hixon.

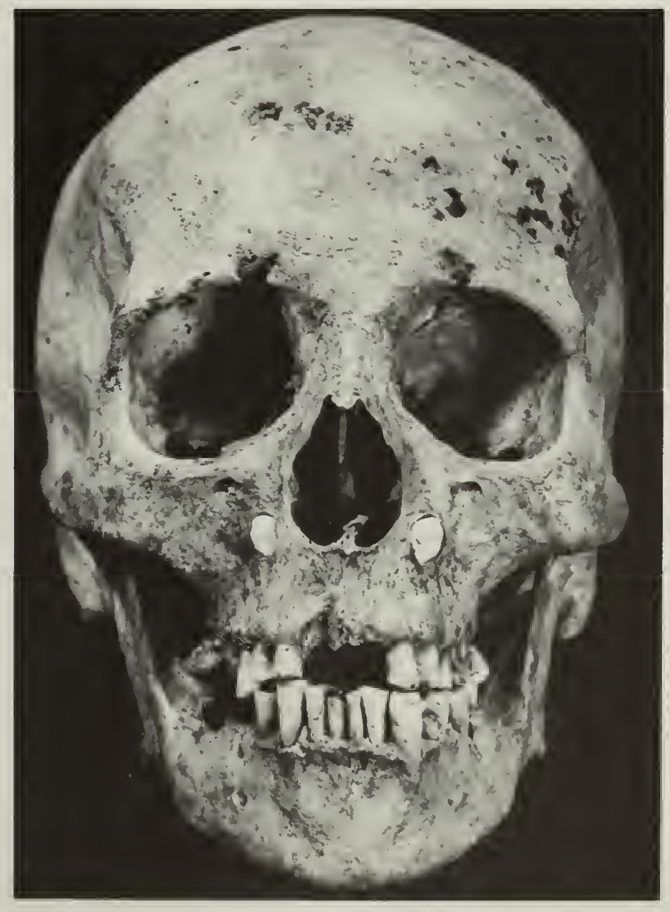
The surviving teeth of every individual who reached adulthood showed marked attrition, perhaps due to grit accidentally mixed with the food and the strong force of mastication. The occlusal (chewing) surfaces were worn flat, generally with the hard enamel covering worn away so that the underlying dentine was exposed (fig. 117). In a few older individuals attrition was severe enough to expose the pulp and cause abscesses at the root ends.

Although the incidence of dental caries was considerably less than is found in modern white American culture, the majority of the adults had at least one or two infected teeth, many of which probably developed abscesses. The pattern of caries also differed in that the principal area of attack was at the neck of the tooth rather than the chewing surface or one of the approximating surfaces (fig. 118).

Heavy deposits of tartar around some teeth (fig. 117) and patterns of aveolar bone loss suggest a high incidence of pyorrhea (fig. 118), which destroyed the ligament binding the tooth to the bone. Because of pyorrhea, caries, and severe attrition leading to abscess formation, many teeth were naturally exfoliated during a person's lifetime, and a few individuals were toothless.

Other traits occasionally noted were supernumerary teeth, congenital absence of third molars, and impacted upper canines (fig. 119). Some individuals exhibited severe crowding of the dental arches, which would have produced severe malocclusions if the teeth had not been heavily abraded.

119 Impacted canines, Burial M43.



CHAPTER 6

economy

When dealing with the remains of prehistoric peoples, we are forced to infer from parts of plants and animals preserved in the site such things as what foods were eaten and how they were acquired and prepared for consumption. In this respect, the evidence from Mug House is unusually helpful. We found dried human feces, large quantities of cultivated plant parts, and many food refuse bones of mammals and birds.

HUMAN FECES

Dried human fecal material was found in many corners behind rooms on the upper ledge and in rooms that had served as refuse dumps after their abandonment. Probably these deposits were made during disagreeable weather or in winter. There can be no doubt that these feces contained some items that were ingested either as food or medicine.

Thirty-two fecal specimens were soaked and then washed through a series of progressively finer screens (Colyer and Osborne, 1965). The residue contained a surprising variety of items. There were numerous hulls of corn kernels and seed fragments of squash and beans. Whole and partly ground seeds of pigweed (*Amaranthus* sp.) and goosefoot (*Chenopodium* sp.) apparently withstood both the grinding process and the human digestive system. Seeds of groundcherry (*Physalis* sp.), skunkbush (*Rhus trilobata*), miner's lettuce (*Montia* sp.), prickly pear (*Opuntia* sp.), and beeplant (*Cleome* sp.) probably represent the non-digestible parts of the fruits of these plants. A great many prickly pear spines, one with a piece of epidermis adhering to it, suggest that parts of this cactus other than the fruits were eaten regularly. Masses of vegetal fibers and vascular bundles may represent roughage taken in the form of greens or cooked plant stems.

Among the more surprising items were tiny fragments of animal bone, including teeth and parts of skulls, fragments of thin white eggshell, parts of cicadas, human hair, and charcoal. The last two items could have been the result of a careless cook.

CULTIVATED PLANT REMAINS

Judging from the relative quantities of food remains, three cultivated plants were clearly dominant in the economy. Foremost among these was corn. The others were squash (*Cucurbita* sp.) and common beans (*Phaseolus vulgaris*).

Corn. All parts of this plant were found: kernels, cobs, husks, leaves, stalks, tassels, root crowns, and pollen (fig. 120). Except for charred cobs, specimens were largely limited to the dry deposits, although virtually every room, area, and kiva in Mug House contained some fragment of corn. Most numerous were corncobs or fragments of cobs (5,605). In general, the prehistoric cobs are much smaller than today's corn. Many undoubtedly represent immature ears—apparently every bit of food was harvested. Charred remnants suggest that corncobs, especially the larger ones, were used for fuel. When dry, they burn well and give off a great deal of heat. In fact, corncobs would have been one of the few fuels available to the Muguenos that would have produced enough heat to fire their pottery. Corncobs were found stuck in the mud mortar of several walls, and one complete ear was discovered with the kernels still adhering to the cob.

Over 1,200 kernels were gathered, mostly from mouse nests and caches. Many of the seed germs had been eaten by mice, which apparently did not survive or stay around long enough to completely devour the remainder of the kernels. The many manos and metates suggest that corn kernels were ground into meal, but the presence of kernel hulls in the feces indicates that some whole kernels were eaten. These kernels may have been eaten off the cob or after parching. Both practices occur among modern-day Pueblo Indians.

We sorted out 468 fragments of stalks, including bases

120 Various remains of corn plants.

of the ears and root crowns. Thirty-nine of the ear bases had been pierced for stringing. One group of 25 had apparently been strung together in Room 44—two of them are still on a knotted yucca strip. We can imagine that many such strings of ears dangled from roofs or wall pegs in some of the storerooms. Other strings may also have been formed by knotting together the stripped-back husks or by looping cordage around the ends of husked ears. We found seven knots of cornhusk that could be remnants from the former practice, and one loose cordage chain that could indicate the latter. We cannot determine however, whether corn was generally stored by any of the methods of stringing, whether the ears were simply stacked in the storerooms, or whether the kernels were first removed from the ears and then stored in containers. Some of the storerooms did contain large jars. Possibly only the seed corn for the following season was strung. Corn lots intended for different purposes may have been stored differently. Eight ear bases with some charred husks still attached could have been short-lived torches.

There were relatively large quantities of husks, leaves, and tassels, often occurring in masses that precluded any hope of counting individual specimens. The many husks suggest that harvested ears of corn were brought from the fields unhusked. The many parts of tassels probably explain the high count of corn pollen recorded in several of the pollen profiles taken in Mug House.

Since all deposits definitely assignable to Components A and B were wet, almost no perishable remains survived. Component A levels produced two charred cobs, and Component B one. The two lowest levels of Area VI, with their seemingly early pottery, contained 149 cobs, 5 stalk fragments, including 1 pierced ear base, and numerous husks, leaves, and tassels. All other corn remains belong to Component C.

Squash. Since we found mainly fragments of squash rind, peduncles or fruit stems, and seeds (fig. 121), it would appear that usually the ripened fruits were brought into Mug House and the other parts of the plants were left in the fields. We saved approximately 610 fragments of rind, 18 peduncles, about 330 seeds, 6 pods, and 4 leaves. One hundred and ninety-five of the seeds were in the sealed corrugated jar in Area V. Several of the rind fragments were ground on an edge, two pieces were drilled, and two were tied together by a piece of yucca cordage passing through a drilled hole in each. Unfortunately, none of these worked fragments are complete enough to permit recognition of their form or function.

Fourteen rind fragments and 16 seeds came from the two lowest levels in Area VI, along with pottery of either Component A or Component B. All other remains are definitely assignable to Component C.

Beans. Lawrence Kaplan has identified all of the Mug House beans as the common bean, *Phaseolus vulgaris* (fig. 122). Three varieties were represented. Most common—194 seeds—was the violet striped bean, a climbing type. Two seeds belong to a variety with cylindrical, solid orange-red seeds, and one to the mottled "Jacob's cattle" bean. According to Kaplan, this last is best considered as a segregating seed type that appears sporadically in other varieties even after long inbreeding. Thirty-five seeds could not be assigned to one of these varieties.

We also recovered several masses of bean pods with a few vine fragments included, suggesting that the violet striped bean was a climbing type that could have been grown among the corn plants. The presence of pods may also indicate that whole pods with seeds inside were occasionally cooked. No other parts of the bean plant were found in the ruin. With the possible exception of

121 Various remains of squash plants.

122 Remains of bean plants.

123 Air view of possible main farmlands for Mug House in middle distance.

several pods found in the lowest level of Area VI, the beans belong to Component C.

Other Plants. Some gourds may also have been cultivated, although we have no direct evidence for this. Because so much of its pollen was found, there is also the possibility that beeplant was at least tolerated as a weed in the fields. It and the pigweeds may also have grown profusely on the refuse dump, thereby releasing their pollen where our soil profiles were taken.

The presence of cotton yarn and textiles in Mug House means that cotton was either grown on Wetherill Mesa or brought in from other areas by trade. Though we found no seeds or parts of the plant that would lead us to believe that cotton was cultivated locally, we still do not know whether cotton fibers or finished products were imported by the Mesa Verdeans.

FIELDS

It is not possible to say exactly what areas were farmed by the people who lived in Mug House. We do know, however, something about the capacity of the surrounding land to grow crops, and that several series of terraces were built prehistorically near Mug House (fig. 40).

The narrow mesa top immediately above Mug House and for over a mile to the north offers little room for fields and is covered with shallow, rocky soils, or lithosols, not particularly favorable to the growth of cultivated plants. Less than a quarter of a mile to the south, the mesa top widens rapidly to about half a mile. Here the soils consist mainly of loess and, with sufficient moisture, could easily support corn, beans, and squash. In all likelihood, this area provided the most important farmland for the occupants of Mug House (fig. 123).

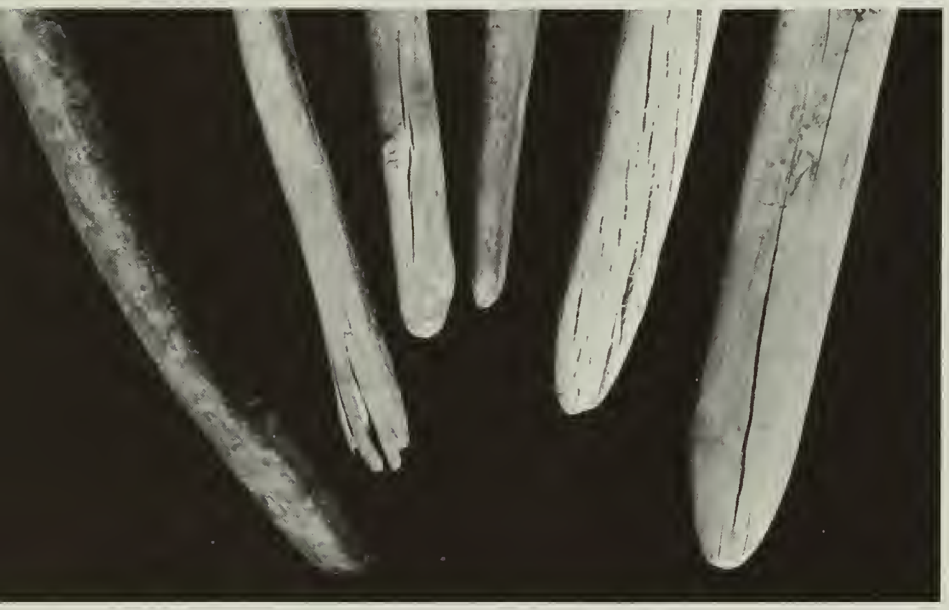
In the canyon south of Mug House much of the lower slope is terraced with crude rock walls. The slope has an average 30 percent grade; each terrace is about 10 feet wide and inclines slightly downward toward a 2- to 3-foot-high stone wall. The total area terraced may approach 16 acres, but we have no way of knowing positively whether the Muguenos ever farmed all or any part of it.

On the other side of the narrow mesa top, in the western tributaries of Rock Springs Canyon, there are several more series of terraces formed by check dams in the ravine bottoms and on some of the slopes. These, too, are relatively near Mug House and could have been cultivated by its inhabitants. There is a fieldhouse near one large terrace series.

AGRICULTURAL EQUIPMENT

Although farming played an important role in the economy, remains of the implements employed are few and poorly preserved. Other than the many fragmentary digging sticks, no tools could be clearly recognized as primarily agricultural. Apparently, this one general-purpose tool performed a multitude of tasks, and techniques had not progressed to a stage where more complex implements were needed. There were no draught animals. Presumably seed and harvests had to be transported to and from the fields using containers and nets, tumplines, ropes and cordage, and possibly other rigging, described in succeeding chapters.

Digging Sticks. One small complete digging stick and 24 blade or tip fragments were recovered from Mug House. Six of these were built into some architectural feature. All the loose ones came from rubble fill in rooms and kivas, and several may once have been built into some structure.



124 *Blade ends of digging sticks.*

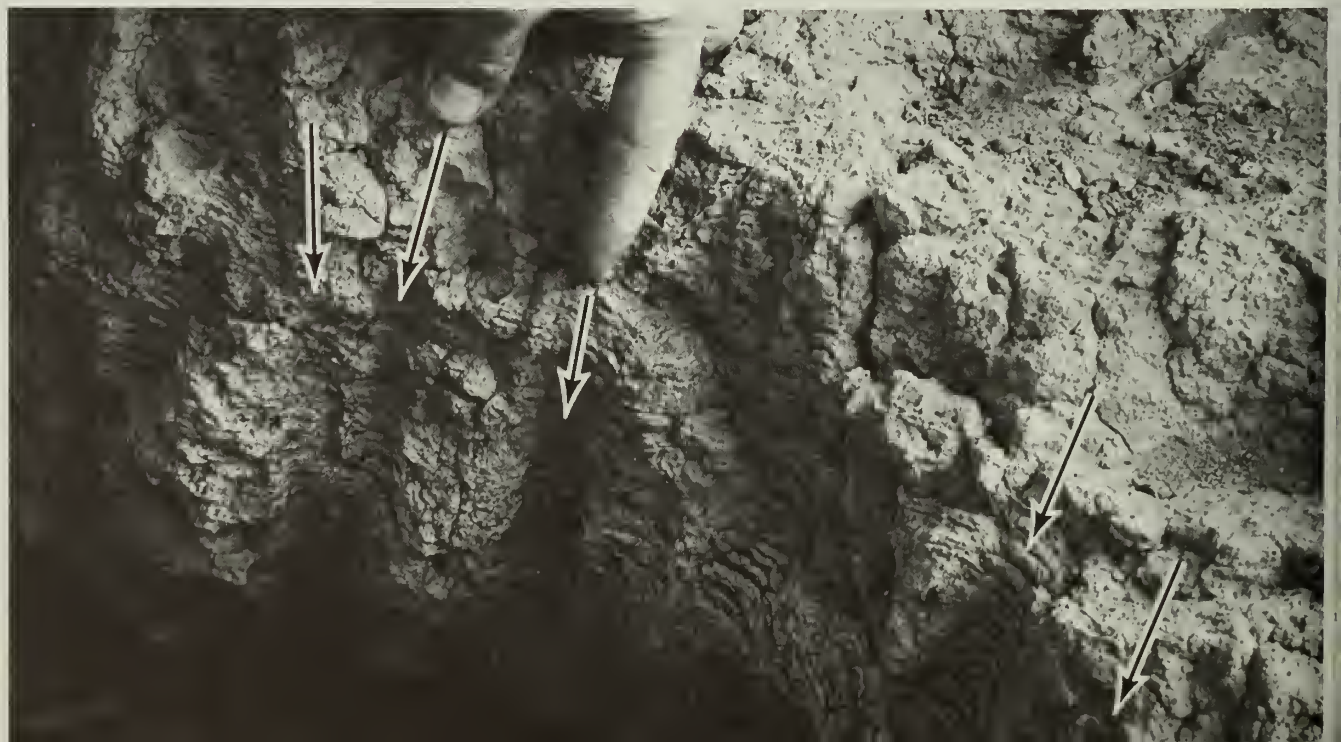
The maker of a digging stick took a stem of hardwood, like serviceberry or oak, peeled off the bark, smoothed the shaft, and ground one end to a flattened bladelike point. The larger sticks were often ground to a roughly rectangular cross section throughout their entire length Diameters of the larger sticks are about 2 by 3 cm. and the smaller ones fall between 1 and 2 cm. The only complete specimen measures 70 cm. (27½ inches) long and is much too small to have been effectively used by a full-grown man. A small knob has been fashioned on the handle end by taking advantage of a knot.

Although the difference in size may reflect the size of the individual using the various digging sticks, some variation in the form of the blade end may indicate a slight difference in function (fig. 124). The more pointed and straighter tips are necessary for breaking ground and digging in the compacted soils of Wetherill Mesa. The flatter blades and those that are curved or hooked would operate better in already loosened soil for weeding or for cultivating around the plants.

We can assume that digging sticks were used whenever dirt had to be moved or broken. Even though they would hardly function like a modern-day shovel, they could easily serve as a pick for loosening dirt to be scooped up with the hands and carried in baskets. We know a great deal of earth was moved in Mug House—in leveling areas on which to build and in excavating for kivas. We also know dirt was quarried from the mesa top and from Adobe Cave for mortar and flooring. Marks of digging sticks are still preserved in the adobe deposit of Adobe Cave (fig. 125).

Mug House digging sticks were made from at least five kinds of wood. Of the 25 specimens in our collections, 10 are serviceberry, 7 oak, 5 mountain-mahogany, and 1 each are of juniper and saltbush. One specimen could not be identified, and one additional stick is represented only by an impression over a doorway. There appears to be no correlation between the material chosen for digging sticks and the part of the ruin in which they were found.

125 *Digging-stick impressions in adobe quarry in Adobe Cave (shown by arrows).*



STORAGE

Agriculturalists require space to store their harvested crops. In Mug House, more than one-third of all rooms were apparently assigned storage functions. Although most of these rooms had been thoroughly cleaned out, some still had containers that may have held foodstuffs. Six corrugated jars, five black-on-white bowls, one black-on-white dipper, and one plainware jar lay smashed in Room 58; three corrugated jars and three black-on-white bowls were found in Room 79; and one corrugated jar came from Room 75.

Other objects were also stored in them. Tools such as manos, grinding and polishing implements, an unhalfted ax head, a woven yucca headring, paint stones, and workable stone cores were found in the same three rooms.

Secondary, but more available, storage spaces were provided by large corrugated jars set beneath the floors of rooms and courtyards where their contents might be used. Probably these held supplies for immediate use. Only a few retained traces of their original contents. One in Area V held a handful of squash seeds, another in Room 30 contained numerous exoskeletal parts of beetles presumably attracted to stored grain or meal, another in Room 71 held skeletal parts of a variety of animals, and still another in the same room contained the skeletons of a large number of shrews. It is difficult to imagine these last as being ingredients in shrew stew. One tightly sealed jar in a dry place was empty.

PESTS

A great many insect pests might have threatened the Mugueno food supply, but only a few actual remains were found in indisputably prehistoric contexts. The following identifications and information have been furnished by Samuel A. Graham.

One species of dermestid belonging to the genus *Attegenus* came from corn debris in Room 47. Dermestids feed on a variety of organic waste, food, and clothing. They were probably a major household pest during the prehistoric occupation of Mug House, and continued to consume abandoned organic materials long after the Indians had departed.

Two species of false wireworms belonging to the Tenebrionidae have been identified as *Eleodes snowii* Blais and *Eleodes nigrina* Lec. Beetles of this family are known to feed on the germ of wheat and on germinating seeds and roots in arid regions. Among other grains they eat is corn. Thus, since both adult and larval stages were found, we may suspect that these insects attacked the Indian corn in the fields and in the storehouses.

An undescribed species of *Niptus*, a ptinid beetle, was found in a number of localities in Mug House. This small spider beetle tunneled extensively in corn debris—leaves, stalks, and cobs—and must have been a serious pest of stored foods.

A species of tenebrionid beetle belonging to the genus *Platydema* was found in the sealed jar beneath the floor of Room 30. Since most members of this group customarily eat items such as meal or seeds, these insects must be reckoned as another pest.

Not all insects were necessarily pests. Graham has suggested that the prehistoric Mesa Verde Indians may have left freshly felled trees on the ground for weeks, while several insect species of phloem-wood borers belonging to the families Buprestidae, Cerambycidae, and Scolytidae effectively loosened the bark. Nearly all of the construction timbers examined showed signs of considerable infestation by these insects (Graham, 1965).

How the Muguenos dealth with such pests we do not know. Perhaps they were unable to combat them at all, or possibly the insects damaged only a relatively small amount of stored food and were thus simply tolerated.

MAMMAL AND BIRD BONES

During our excavation we saved every bone or fragment of bone that might be identifiable. We did discard many tiny fragments, as well as a number of bones that obviously were deposited long after the Indian occupants left the site. A total of 2,954 worked and unworked specimens was ultimately submitted to the National Park Service's Southwest Archeological Center in Globe, Ariz., for identification. The mammal bones were studied by Thomas W. Mathews, and the bird bones were studied by Lyndon L. Hargrave. Both men took pains to identify each skeletal element and to determine the species to which it belonged. In addition, they made numerous observations, such as the approximate age, probable sex, and size of the animal; the condition of the bone—color, presence of mineralization, and so forth; and the presence of cutting marks or evidence of work in connection with the manufacture of an artifact.

Specimens were assigned to taxonomic categories as defined by Anderson (1961) and by Hall and Kelson (1959). Only those categories to which bones were assigned are listed. The taxonomic level is indicated by the indentation from the left margin, and the numbers of specimens are given in parentheses.

- *Mammalia-Aves*—mammals-birds, unknown (3)
- *Mammalia*—mammals, general (40)
      - *Sorex* sp.—true shrews, general (326+)
      - *Lepus* sp.—hares, general (1)
      - *L. californicus*—black-tailed jackrabbit (21)
      - *Sylvilagus* sp.—cottontails, general (706)
      - *S. nuttallii*—Nuttall's cottontail (4)
      - *S. audubonii* cf. *warreni*—desert cottontail (8)
  - *Rodentia*—rodents, general (5)
    - *Sciuridae*—squirrel family (4)
      - *Marmota flaviventris*—yellow-bellied marmot (16)
      - *Cynomys gunnisoni*—Gunnison's prairie dog (2)
      - *Spermophilus* sp.—rock and ground squirrels, general (15)
      - *S. variegatus* cf. *grammurus*—rock squirrel (122)
      - *Thomomys* sp.—smooth-toothed pocket gophers (6)
      - *T. umbrinus*—southern pocket gopher (3)
      - *Peromyscus* sp.—white-footed mice, general (19)
      - *P. maniculatus*—deer mouse (2)
      - *Neotoma* sp.—wood rats, general (154)
      - *N. cinerea*—bushy-tailed wood rat (50)
      - *Microtus* sp.—meadow vole (1)
      - *Erethizon dorsatum*—porcupine (1)
  - *Carnivora*—carnivores, general (2)
      - *Lynx* sp.—lynx and bobcat (4)
      - *Lynx rufus* cf. *baileyi*—Bailey's bobcat (15)

- *Canidae*—dog family (1)
  - *Canis* sp.—wolves, dogs, and coyotes (15)
  - *Canis lupus*—gray wolf (1)
  - *Canis familiaris*—dog (10)
  - *Canis latrans*—coyote (16)
- *Procyonidae*—racoon family (4)
- *Mustelidae*—mustelid family (1)
  - *Mustela frenata*—long-tailed weasel (1)
  - *Taxidae taxus*—badger (4)
  - *Spilogale gracilis*—western spotted skunk (2)

Artiodactyla—even-toed ruminants, general (63)
  - *Ovis canadensis*—bighorn sheep (32)
- *Cervidae*—deer family, general (1)
  - *Cervus canadensis*—wapiti (American elk) (1)
  - *Odocoileus* sp.—deer, general (23)
  - *Odocoileus hemionus*—mule deer (63)

Aves—birds, general (28)
  - *Meleagris gallopavo*—turkey (1,074)
  - *Cathartes aura*—turkey vulture (30)
  - *Bubo virginianus*—great horned owl (4)
  - *Aquila chrysaetos*—golden eagle (7)
  - *Buteo jamaicensis*—red-tailed hawk (8)
  - *Buteo regalis*—ferruginous hawk (5)
  - *Falco sparverius*—sparrow hawk (1)
  - *Zenaidura macroura*—mourning dove (1)
- *Tetraonidae*—grouse family, general (1)
  - *Centrocercus urophasianus*—sage grouse (13)
  - *Dendragapus obscurus*—blue grouse (1)

Anseriformes—ducks, geese, and swans, general (1)
  - *Branta canadensis*—Canada goose (5)
  - *Olor columbianus*—whistling swan (1)

Passeriformes—perching birds (1)
  - *Corvus corax*—common raven (4)
  - *Perisoreus canadensis*—gray jay (1)

Not all of the bones we found in Mug House can be attributed to the period when the Indians lived there. After the Muguenos departed, several kinds of mammals, lizards, and birds occupied the abandoned buildings or used them for temporary shelter. In fact, our excavations evicted quite a menagerie. Other creatures probably also used the rock shelter for a long time prior to the coming of man. The physical remains of these creatures and the things they brought into the cave must be separated from the assemblage on which we base our interpretations of prehistoric life in Mug House. Actually, all remains about which there is any doubt as to their association with the human occupation of the site have been omitted from consideration. We must know something of the nature of this non-human cave use, however, in order to evaluate many marginal specimens.

Post-Occupational Remains. Color proved to be one of the best criteria for distinguishing bones of recent origin. An ivory-tan color was typical of most bones dating from the period of occupation, so that the stark white of the post-occupational bones stands out. In addition, adhering bits of felted hair and the like marked some bones as having once been part of carnivore scats.

Since we found mice, wood rats, and lizards living in the ruin when we began excavations, we have considered all skeletal elements of these animals not found in occupational associations to belong to the post-Indian period. Many of these bones were not saved. Some elements of ivory-tan color may actually date from the human occupation, but because there is a doubt they cannot be safely included in our interpretation.

There is evidence that other creatures—cottontail, meadow vole, western spotted skunk, and turkey vulture—also used the ruin for shelter after the Indian abandonment. Bones representing as many as 23 turkey vultures, including the dried carcass of one young bird, were gathered from the surface of many room fills and refuse deposits in the upper ledge. None were found *within* any of the deposits. Their droppings, however, marked several of the walls. As these birds would not live in close proximity to humans, their presence must postdate the Indian abandonment of Mug House.

Scats of the above-mentioned animals and of several carnivores also littered the surface of much of the ruin. Coyote, ringtail, and fox dung were definitely identified, and other scats may have come from bear, bobcat, and cougar. We may assume that these animals carried some of their prey into the shelter of the ruin. In this way, some of the bones of rodents and rabbits probably found their way into the places where we collected them.

Partially Mineralized Remains. A number of bones stood out because of partial mineralization. Although they were found in human deposits, they could have been mixed in by human disturbance of the underlying natural cave fill. The bones were identified as yellow-bellied marmot. This species today customarily occupies the cooler parts of the Mesa Verde, but a few have been observed in the draw below Long House, and in Sunset House, south of Cliff Palace, and on the cliff above Oak Tree House, on Chapin Mesa.

Animal "Guests." Many mouse bones were discarded in the field because they had obviously come into the cave after 1300. However, 20 skeletal elements or dessicated carcasses of a minimum of 13 individual white-footed mice can be safely equated in time with the prehistoric Indian occupation. Most of the bones had been placed inside two storage jars by the occupants of Room 71, but at least five individuals were found elsewhere among the rubble. These animals apparently lived in Mug House along with the Indians, and probably raided their stored foodstuffs or ate discarded table scraps. If many of the mouse bones of doubtful age we discarded were really contemporary with this group, and if we overlooked many others because of their small size, mice might have been numerous enough to act as major pests.

Dogs—Possible Pets? Dog remains were scarce in Mug House. There were 10 bones from at least 4 animals, but all were found widely scattered through the rubbish. We found no dog droppings within the deposits, although both human and turkey dung were plentiful. We may wonder whether the Muguenos themselves had dogs or whether the few bones could have come from animals that lived at other sites.

Special Bone Groups. Three complete or nearly complete turkey skeletons were found at Mug House. One 3- to 4-week-old chick came from Level IV of the trash slope beneath the retaining wall that runs north from Kiva A. This bird was not buried and may simply have been discarded on the trash heap after it died.

Against the cave wall in the lowest fill of Area V, we came across 65 bones of an old hen turkey. Major parts of its axis and of both sides were represented, although the femora and part of the backbone were missing. The absence of tarsal splints—filaments of bone associated with the muscles of the tibiotarsus—indicates that the flesh had been removed before the bird was buried. Similar splints associated with the tarsometatarsi were present. These splints, plus the cut marks on the distal end of the tibiotarsus, indicate the lower legs and feet were cut off before removal of the flesh. Subsequent to both of these operations, the lower legs with splints (there is no meat on them anyway) and the rest of the bird's bones, minus tarsal splints and several elements, were either buried together or placed together in a pile that soon became buried. Presumably this turkey was eaten and the unusable parts were discarded.

A third turkey skeleton, a hen about 1 year old, had been crammed into a small hole in the floor behind the deflector in Kiva D. All major elements were present except for the vertebrae, pelvis, left ulna, the right half of the upper mandible, many of the phalanges, and most of the bony splints. Apparently the flesh had also been removed from this bird. Most of the bones were broken, probably before burial. Finding this turkey in a kiva suggests that it served some ceremonial purpose.

Rabbit bones also occurred in several apparently special groupings. Inside the horizontal part of the Kiva H ventilator, we encountered skeletal parts of three cottontails. The first individual was represented by two metatarsi. The second was represented by 16 bones, including all the long bones, but minus the skull and mandible, all vertebrae and ribs, and most of the foot bones. Thirty-four bones belonged to the third animal, a desert cottontail. Although this rabbit skeleton was nearly complete, many significant elements are missing: left dentary, right humerus, left radius, all but three of the vertebrae, all but six of the ribs, and most of the smaller bones of the feet. There can be little question that the bones were placed in the ventilator tunnel, but their purpose is unknown. They are not likely to be food refuse. Like the Kiva D turkey, they could have served a ceremonial purpose.

The ventilator tunnel of Kiva C also contained a group of bones, representing many individual animals. There were three turkey bones and two rock squirrel bones, all of which could be accidental inclusions. The remaining 70 bones were all cottontails, with one adult skull identified as a desert cottontail. At least 11 rabbits are represented, including 2 adults, 3 young adults, and 6 immature. The immature rabbits must have been taken during early to late summer, but if the entire group was collected at the same time, this time would have to be late summer. It is hard to imagine the users of Kiva C threatening the efficiency of their ventilator by cluttering it up with food refuse. Yet people must have placed these bones there. Half of the total are long bones; and scapulae and pelvic bones account for another one-fifth. There are only two crania, three dentaries, and seven lumbar vertebrae, which were possibly once attached to the pelvis. Most meat would be found on the hind quarters and along the back, so the presence of 18 foreleg bones and the paucity of vertebrae suggests meatiness was not a prime consideration in the selection of these elements.

Bones in Pottery Vessels. Two corrugated storage jars were found set beneath the floor of Room 71 and covered with sandstone slab covers. Both jars contained large numbers of animal bones. The dirt fill in one jar contained so many tiny bones that only one-third of it was carefully picked over in search of bones. All but three of the collected bones came from shrews in the following proportions:

30 crania
64 dentaries: 33 right, 31 left
32 innominates: 14 right, 18 left
38 femora: 20 right, 18 left
46 tibiae: 28 right, 18 left
8 sacra
15 scapulae: 8 right, 7 left
14 humeri: 6 right, 8 left
20 ulnae: 10 right, 10 left
11 radii: 6 right, 5 left
48 vertebrae: cervical, thoracic, lumbar, and caudal
Uncounted number of ribs
Unsorted minor skeletal elements

A minumum of 33 individual shrews is represented by the 326 tabulated elements. Since this represents only one-third of the fill, the pot must have held about 100 or more shrews. A great range in age and size is represented among the 33 individuals, and probably both sexes are present. One mouse bone, one turkey bone, and one bone from some unknown rodent complete the collection.

How did so many shrews get into this pot? A naturalist knows that an empty pot sitting in the ground makes an ideal trap for shrews, particularly if there is food or water in it. We could not determine whether the stone cover sealed the vessel mouth, but if it had not done so these tiny animals could have squeezed in. Shrews could have crawled into any one of more than a dozen other similarly situated pots, including one less than a foot away; yet none of them did. Nor were any other shrew bones recovered from any other part of the site.

The present habitat in the immediate vicinity of Mug House does not favor shrews. Unless there was water seepage from the cliff adjacent to or in the cave during prehistoric times, the environment would have been no more favorable. We must conclude, therefore, that some Muguenos collected a large number of shrews and placed them in this pot.

There is hardly enough meat on these tiny animals to make their collection worthwhile, even for a stew. We have no evidence that shrew bones or skins served any practical functions. For some reason, someone wanted a lot of shrews. He or she stored them in a pot set into an old slab-lined hearth beneath the floor of Room 71—a room that gives the appearance of being a sort of kitchen—and covered it with a sandstone lid. Apparently the prime value of these shrews resided in their mere presence, or in the feat required for their capture.

Stevenson (1904, p. 49) mentions the shrew as the Zuñi beast god representing the Nadir, who, aside from the customary efficacy in treating illness, provides protection for the stored grains and other foodstuffs from incursions by mice and other rodents. The shrew is also mentioned in the mythology of Zia Pueblo (Stevenson, 1894, p. 39) and Cochiti (Parsons, 1939, p. 94).

The companion jar in Room 71 contained 1 bone awl, made from the tarsometatarsus of a turkey, and 121 bones from a wide variety of animals:

cottontail: 5 bones from at least 3 individuals
wood rat: 64 bones from at least 4 individuals
white-footed mouse: 12 bones from at least 3 individuals
pocket gopher: 1 bone
squirrel family: 1 bone
unknown rodent: 7 bones from 1 individual
unknown small mammal: 1 bone
turkey: 11 bones from 1 individual
red-tailed hawk: 4 bones from 1 individual
unknown perching bird: 1 bone
unknown reptile or amphibian: 7 bones
unknown: 7 bones

A minimum of 17 individuals of at least 10 different species is represented in this collection. No whole animals were put into this pot, although there are enough bones to make up most of two wood rats. Even among all the wood rat bones, very few match one another as if they had come from the same animal. Instead, the bones suggest that parts of animals were contributed to the contents of this jar.

The total "recipe" would seem to have included three cottontail heads—at least one of them a desert cottontail—and one rabbit foot bone; various parts of several wood rats; one head, one right foreleg, and several isolated bones of mice; the head of a squirrel-like animal, possibly a prairie dog; one gopher tooth, a molar; one turkey foot; one hawk foot; the left wing of a perching bird; and several reptile or amphibian parts. Perhaps the bone awl should also be added.

All of these animal parts, except for some of the wood rat parts and possibly brains, are inedible. But they cannot be considered simply waste sections, for no cook would waste so many edible parts of wood rats. Several of the creatures were apparently not eaten at all at Mug House—mice, prairie dogs, hawks, perching birds, and reptiles. Here, too, the many animal parts must have possessed some symbolic value.

Animals Sought Principally for Artifacts. Most of the bones of some animals were fashioned into artifacts. This does not indicate that these animals would not also have been eaten, but it does show that they could have been collected for reasons other than food. All seven elements of golden eagle formed a single necklace. Some eagle feathers were also found, but since no eagle bones were found among the food refuse, we may conclude that the Muguenos did not eat this bird. The lone whistling swan bone was also made into an artifact; it could have been acquired in trade. Three of the five Canada goose bones were made into ornaments.

Nine-tenths of the 32 bighorn bones were made into tools. The bulk of these (23) were humerus scrapers. Apparently the humeri were specially sought and only rarely did other elements get into Mug House. No more than 7 bones could have come from any one animal, and most of the 17 minimum number of animals are represented by one or both humeri. Two of three unworked bones are from immature and young adult animals, but all other elements come from adults. Perhaps the three unworked bones represent cuts of meat from three individuals, but such extreme selectivity suggests that the Muguenos *did not hunt* bighorn for food. If they did, the hunters must have cut the meat off the bones in the field, saving only the humeri to take home. Trade with other people for meat and bones could also account for the peculiar representation of bighorn bones in Mug House.

The majority of the 87 deer antlers and bones, probably all mule deer, were made into artifacts. In contrast to the bighorn situation, most skeletal elements were present, and all of the bones could have come from as few as 17 individuals. It looks as though large portions of deer had been brought into the site, from the presence of 30 unworked skeletal elements including ribs, vertebrae, scapulae, long bones, and antler fragments. Butchering scars were observed on some ribs, and several of the bones, both worked and unworked, were scorched or burned. All of the worked bone elements could have been derived from deer that were killed primarily for food.

Probable Food Animals. Relatively few of the animals identified from Mug House bones represent sources of food (table 11). Many of the animals could have been killed for other reasons. Some may have threatened the domestic turkeys, the stored supplies, or even the crops in the field. Others may have been killed on chance encounters. Still others may have been sought primarily for such non-food materials as bones, feathers, or fur. Single bones of some species could have come to Mug House in trade or might have been found by people while away from home.

The most important single source of meat seems to have been the domestic turkey. We saved 1,074 bones representing from 138 to 815 individuals. Undoubtedly, many of the small fragments of bone we discarded in the field were also turkey. Aside from the three nearly complete skeletons, unworked and disarticulated bones turned up in every refuse deposit. Many were broken, several showed cut marks from butchering, and several bone parts such as the proximal head of the tibiotarsus and the crest of the sternum were consistently missing, as if they had been intentionally removed. Long bones of the leg were found without their accompanying splints, indicating that they had been discarded after their flesh was taken off. Several bones were scorched. Two of the three nearly complete skeletons seem to have been put in position only after the flesh was removed. Probably all of the turkey bones used for artifacts came from birds first used for food.

Judging from the number of bones (713) and the minimum number of individuals (115), cottontails are second to turkeys in popularity. Their bones were also found throughout the rubbish. Most often encountered were the skeletal elements that carry the most meat: tibiae (150), innominates (101), humeri (61), scapulae (58), and femora (57). Other numerous rabbit bones included dentaries (70), metatarsals (49), radii (34), ulnae (31), and crania (28), none of which have any meat. Ten of the tibiae had been perforated for use as some kind of artifact. Many of the bones were broken.

TABLE 11.—PROBABLE FOOD ANIMALS

Probable food animals	General dispersal throughout Mug House				Found grouped together	
	Total number of bones	Minimum faunal count	Estimated number of individuals	Number of worked bones	Number of bones	Number of individuals
Primary food animals:						
Turkey	1,074	138	818	164	215	3
Cottontail	713	115	544	10	127	17
Rock squirrel	137	27	125	0	2	2
Wood rat	175	36	112	0	64	4
Deer	87	17	85	57	....	....
Minor food animals:						
Bighorn sheep	32	17	32	29	....	....
Jackrabbit	22	12	22	8	....	....
Sage grouse	13	4	13	0	....	....

Rock squirrel bones numbered 137, from a minimum of 37 individual animals. None of the bones had been made into artifacts. They occurred in the trash, and many of them were broken.

When all specimens of doubtful association were subtracted from the total number of wood rat bones, there were 175 bones, representing at least 36 individuals, that could be said to date from the human occupation of Mug House. A sizable proportion (64 bones of 4 individuals) were found in one storage jar, but the rest of the bones account for a minimum of 32 animals. Most of these animals came from accumulations of rubble filling rooms and kivas, but quite a few also came from the trash deposits. Wood rats were eagerly sought after and eaten by the historic Indians of Zia Pueblo (Stevenson, 1894, pp. 25–26).

The 87 deer bones represented only 17 individuals, but these animals would have supplied more meat than the smaller ones. Although most of these bones were ultimately made into artifacts, butchering scars and scorching appear on several of the unworked specimens.

We have already seen how most of the bighorn bones had been carefully selected for the manufacture of artifacts, but there is still a good probability that some bighorn meat was eaten. Jackrabbits, too, were probably eaten, but rarely, if the number of bones is any indication. Thirteen of the 22 bones were tibiae, and 8 of them had been perforated for use as artifacts. Apparently the prime value of a jackrabbit lay in its two tibiae, and its meat was only of secondary importance. The four sage grouse represented by 13 bones may also have been eaten, but we have no direct evidence for this.

Of the five primary food animals, turkeys seem to have been the most important. It is hard to judge whether deer or cottontail would have provided the greater amount of meat from the meager evidence of the number of bones in our collections and the minimum number of individual animals represented by these bones. In any event, both deer and cottontail figured strongly as sources of meat. Wood rats and rock squirrels came after the other three, and may have been of roughly equal importance. We may assume that when they had a chance—and this may have been rare—the Muguenos ate bighorn, jackrabbit, and sage grouse. They may also have tried such animals as badger, bobcat, and coyote, but the presence of bones of these animals can just as easily be explained in other ways.

We cannot determine how complete our sample of the food refuse is. There may have been other methods for disposing of waste materials. Several of the small mammal bones had been gnawed by carnivores and rodents. Perhaps many bones were devoured by such animals.

Component A Fauna. Very few bones were found in the deposits clearly assignable to the 11th-century occupation. The animals of this component include cottontail (2 bones), black-tailed jackrabbit (1), rock squirrel (3), dog (2), wapiti (1), deer (3), and turkey (6 bones and 1 chick). Undoubtedly there were other animals and birds, too, that have not been preserved in the deposits of Mug House. Also, some of the bones for which the provenience is not precise may have belonged to this component. It may be significant that wood rat, coyote, bobcat, and bighorn were absent.

Component B Fauna. Bones of the five chief food animals were present in deposits belonging to the 12th-century occupation: cottontail (42 bones), rock squirrel (22), wood rat (4), deer (7), and turkey (59). In addition, there were black-tailed jackrabbit (7 bones), bobcat (1), badger (1), sage grouse (2), and raven (1). There must have been other animals and birds in this assemblage that our collections do not contain. Significant absences may include dog, coyote, wapiti, and bighorn.

Component C Fauna. Remains of the main food animals—turkey (517 bones), cottontail (472), deer (68), wood rat (150), and rock squirrel (91)—dominate this assemblage. Both Nuttall's cottontail (4) and the desert cottontail (7) are present. All the bones we found of shrews (326), pocket gophers (9), porcupine (1), coyote (16), weasel (1), bighorn (31), great horned owl (4), golden eagle (7), the red-tailed (8) and ferruginous (5) hawks, sparrow hawk (1), mourning dove (1), blue grouse (1), Canada goose (5), whistling swan (1), and gray jay (1) belong to this component. In addition, there are some remains of jackrabbit (7), prairie dog (1), white-footed mouse (20), dog (2), bobcat (14), badger (2), sage grouse (7), and raven (2). The only wolf bone we found belongs to one of the three components, but we could not determine which one. Again, wapiti was missing. We also have pieces of skin from deer, rabbit, and rock squirrel.

Although our information is fuller for Component C than for the two earlier components, we must remember that most of the remains we have collected are the result of largely economic selection by human beings. Because all of these animals and birds may be seen at Mesa Verde today, we may assume that the other members of our present-day fauna not represented in the collections were also present then, and that the faunal picture around Mug House has changed little if at all during the past 700 years.

DOMESTICATED ANIMALS

Except for the possibility that dogs may have been kept in Mug House as pets, as watch dogs, or as companions for hunting, turkeys seem to have been the only domesticated animals.

Several lines of evidence demonstrate clearly that turkeys were kept and raised in Mug House. Turkey droppings were collected from various locations scattered throughout the ruin, often associated with human feces, usually in a definite Pueblo III context, and disassociated from the scats of post-human animal cave users. Large quantities of turkey dung were compressed and matted with feathers and gizzard stones in Room 46 and in the backdirt thrown out of Room 46 by earlier excavators. Such compression and matting occur when birds are confined to a relatively small space for some time, as in a poultry yard. It is thus apparent that turkeys were quartered in Room 46, a space that stands apart from other rooms in size and in the absence of room features such as a floor or hearth. Olaus J. Murie noted that the average size of the scats is a little smaller than usual for turkey and may have come from immature birds.

Turkey gizzard stones were numerous in the refuse (87 were actually collected). All stages of wear are represented—from the slight smoothing of rough edges to the fine overall polishing acquired in the birds' food grinding operation. Since more than three-quarters of the gizzard stones are gray chert—the most common chipping material—the turkeys must have picked them up from the trash dumps as waste chips. Only domesticated birds could have had unhampered access to the trash dumps.

Turkey bones—1,074, representing at least 138 individuals—were recovered from nearly all the deposits. (This count excludes a multitude of small fragments that we discarded in the field.) They were present in all three components. The three turkey skeletons included a poult and a young adult. The presence of young birds in Mug House adds weight to the supposition that turkeys were raised at the site.

Like the bones, turkey feathers predominated over those of all other birds belonging to the human occupation periods. The extensive use of turkey feathers in the manufacture of robes and blankets suggests that they were easily available.

Small fragments of turkey eggshell were encountered in seven places within the ruin. While it is entirely possible that the Muguenos gathered eggs from the nests of wild turkeys, it is more likely that the eggs were actually laid in Mug House by domestic birds.

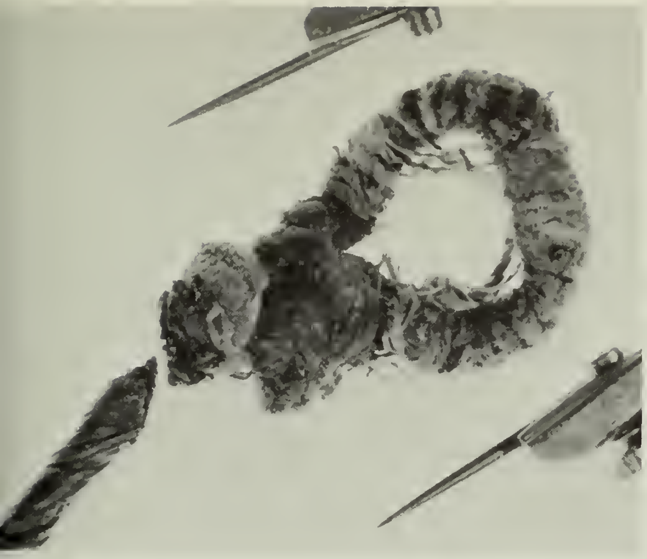
Since it is apparent that turkeys shared Mug House with its human occupants, what role did they play in Mugueno culture? They were an important source of food, as evidenced by the numerous bones found scattered among the refuse deposits. Many of these bones are cracked and charred. At least 164 bones were made into tools such as awls, needles, awls with transverse grooves, reamers, and scrapers, or into tubular beads. In fact, turkeys provided the most important single source of raw material for bone implements in Mug House. The use of turkeys for food and their bones for artifacts seems to have begun at the same time. Turkeys may have been valued most of all for their feathers. Large quantities of down feathers found their way into feather robes and blankets; wing feathers may have been used in ceremonial paraphernalia as modern-day Pueblo Indians use the feathers of many birds. The scarcity of turkey eggshells in the ruin suggests that turkey eggs were rarely if ever eaten.

Patterns of care and ownership of domesticated turkeys in Mug House are beyond our knowledge. We do know that Room 46 functioned as a turkey pen, perhaps the only one in the entire village. We also know that many birds roamed throughout most of Mug House, for scats were found in most dry deposits. We do not know if the birds wandered loose or were tethered to notched and grooved stones like some of those found in the ruin.

HUNTING EQUIPMENT

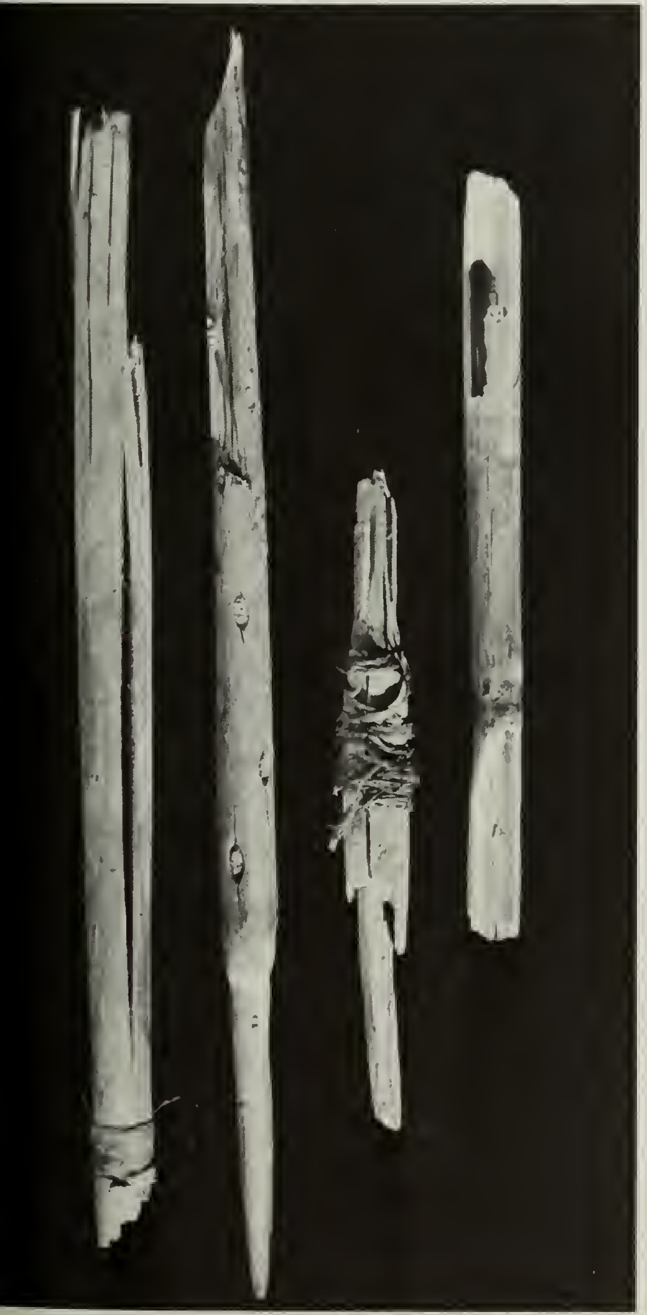
Items employed in hunting activities are as scarce as agricultural implements in the collections from Mug House. From ethnographic data, we would expect to find bows and arrows, clubs, throwing sticks, nets, snares, fetishes, and other objects probably used in hunting ritual. We did find part of a bowstring, several arrow fragments, a number of arrowpoints, and several apparent fetishes. It is possible that some of the pieces of cordage found once belonged to nets or snares. Fetishes are discussed with other apparent ceremonial objects in ch. 11.

Bowstring. Two fragments of a bowstring were found in the trash fill of Room 29 (fig. 126). The larger piece is a Z-twisted sinew cord 0.2 cm. in diameter and 23 cm. (9 inches) long, with one end wrapped with sinew. This piece is smooth and apparently well worn. The other fragment, of the same sinew, includes an eye formed by two or three figure-eight or overhand knots at its base. The whole eye, including its base, is wrapped with 2-ply Z-twist yucca twine about 0.1 cm. in diameter, concealing almost all the sinew. The inside diameter of the eye is 1.0 cm.



126 *Fragments of bowstring. Divider points are 1 inch apart.*

127 *Fragments of arrow shafts.*



These fragments were identified as parts of a bowstring by Carolyn Osborne, on the basis of whole specimens in the Colorado State Museum. (Mrs. Osborne is preparing a report on old Mesa Verde collections in the Colorado State Museum and in several other museums in the United States.)

Arrow Shaft Fragments. The four fragments of arrow shafts from Mug House give a surprisingly good idea of arrow making (fig. 127). There are three sections of reed (*Phragmites* sp.) shafts: one from the fill of Kiva E retains impressions of three feather vanes and their wrappings near the nock end; another from the floor of Area I retains part of some sinew wrapping near one end and most of an overall coat of red paint; and the third from the fill of Room 39 contains the broken end of a mock-orange (*Philadelphus* sp.) foreshaft with part of the sinew wrapping around the joint. A broken foreshaft of saltbush (*Atriplex* sp.), with a specially prepared end for insertion into a reed shaft, was recovered from backdirt. Instead of an artificially formed shoulder, the Room 39 foreshaft fragment makes use of a natural node on the stick as a shoulder to prevent the foreshaft from being driven into the reed shaft upon impact. This suggests that one of the wooden awls described in chapter 9 may be a self-pointed wooden foreshaft, although the polish around its tip would be expected from use as an awl.

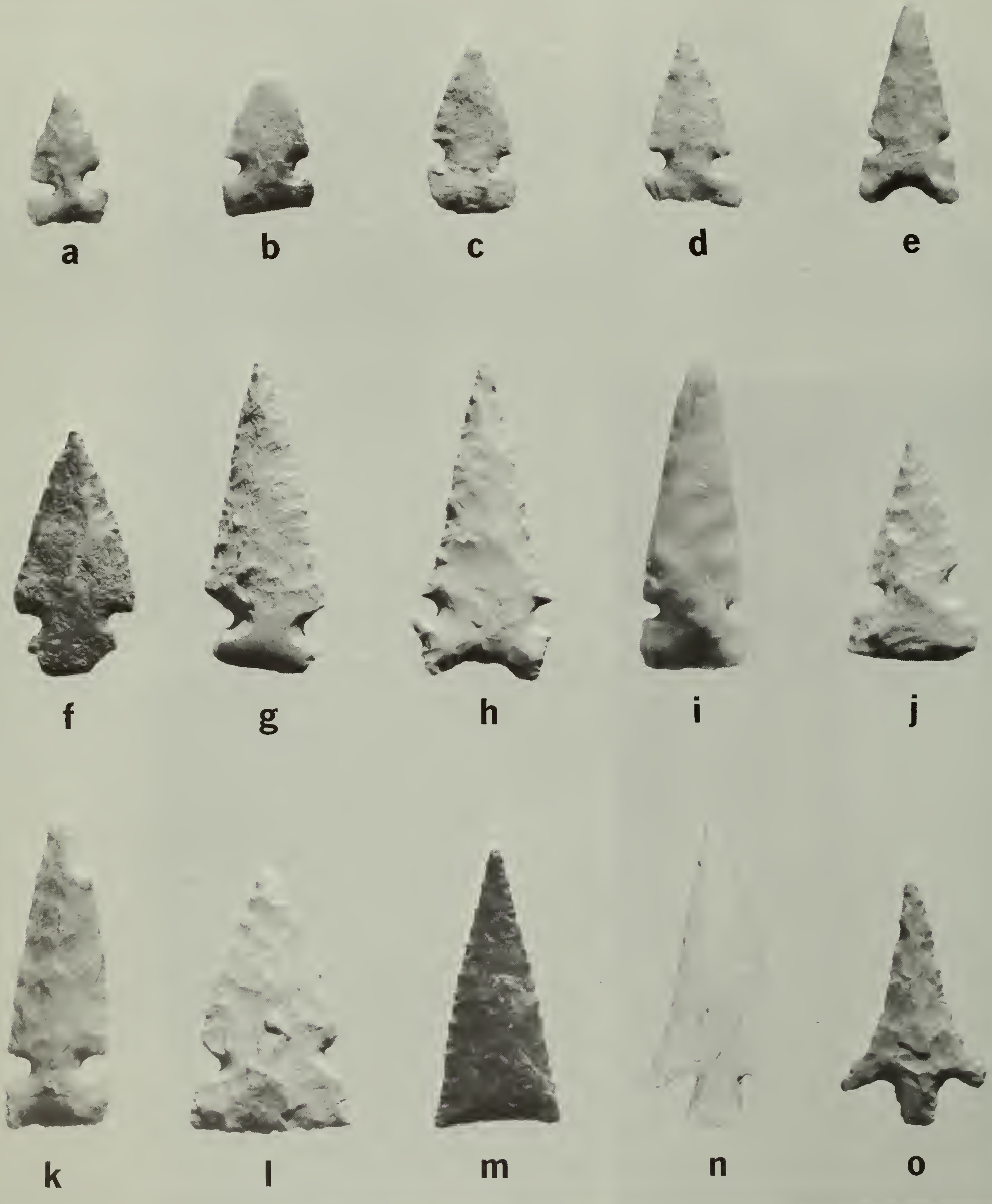
Thus Mugueno arrows can be called compound: a reed shaft with three feather vanes attached to the nock end, and a wooden foreshaft in which a stone point was mounted (or a wooden point was inserted) at the head. Joints and attachments were secured by wrappings of sinew and the shafts were painted red. Our sample is much too small, of course, to assume that all arrows had these features.

Stone Arrow Points. Our excavations produced a total of 19 whole or broken stone arrow points. Even if the early diggers had recovered an equal number—and they moved no more than one-fourth of all deposits—the total represents a small proportion of the stone artifacts.

The possibility that most arrows at Mug House had wooden points should not be overlooked. In a cave in the Mogollon Mountains in New Mexico, only 11 foreshafts of an estimated 4,000 arrows were notched to hold stone points (Hibben, 1938, p. 38). This marked disproportion between wooden and stone points may have obtained in Mug House also. But the fact is that few fragments of arrows came to light among the perishable materials removed from the ruin. Granted that bows and arrows would have been carried away as their owners moved, I think it safe to conclude that these weapons were not important in the food quest of Mug House occupants.

Further support for this inference comes from finding four complete points in what appears to have been a medicine kit interred with Burial M6. None of these could have been hafted at the time of their interment. Other points came from Burial M28 (one), from the floor of Kiva D (one), and in Room 31 (three). The remaining specimens were found in trash accumulations.

The characteristic stone arrow point from Mug House is small, triangular in outline with a straight or concave


a
b
c
d
e
f
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128 Stone arrow points.

ase, and it has two opposed lateral notches a short istance from the base (fig. 128a–e). The 14 points of his type range in length from 1.7 to 4.1 cm. (⅝ to 1⅝ nches) and in weight from 0.4 to 2.8 gm., with an average f 1.5 gm. for 12 of them. Eleven were made from gray uartzite, two from chert, and one from chalcedony. 'hey were chipped bifacially on the edges and notches, ut not always flaked entirely on both faces. Each of the our found in the grave of Burial M6 displays some berrant feature. Both faces on one have been extensively round (fig. 128f); the base and adjacent portions of oth faces of another were also ground (fig. 128g); a hird has been dulled and blunted all over as if from vater action or extensive handling (fig. 128i); and the ourth displays a marked change in direction of its sides elow the notches (fig. 128h).

One point of reddish-brown jasper, found on the floor f Room 31, shares all the features of the side notched oints except for the side notches (fig. 128m). It is 3.5 m. long and weighs 1.5 gm. Despite the variation, it s apparently contemporary with the side notched points.

Two points have the shape and other features conistently found on Pueblo I arrowheads from the Mesa 'erde region (Brew, 1946; O'Bryan, 1950). They are temmed with concave sides and long flaring shoulders r barbs (fig. 128n–o). One of them, made from common pal, is 4.1 cm. long and weighs 1.8 gm. and was found n the rubble of Kiva D. The other, of green chert, is .5 cm. long and 1.3 gm. in weight and was found in oom 31.

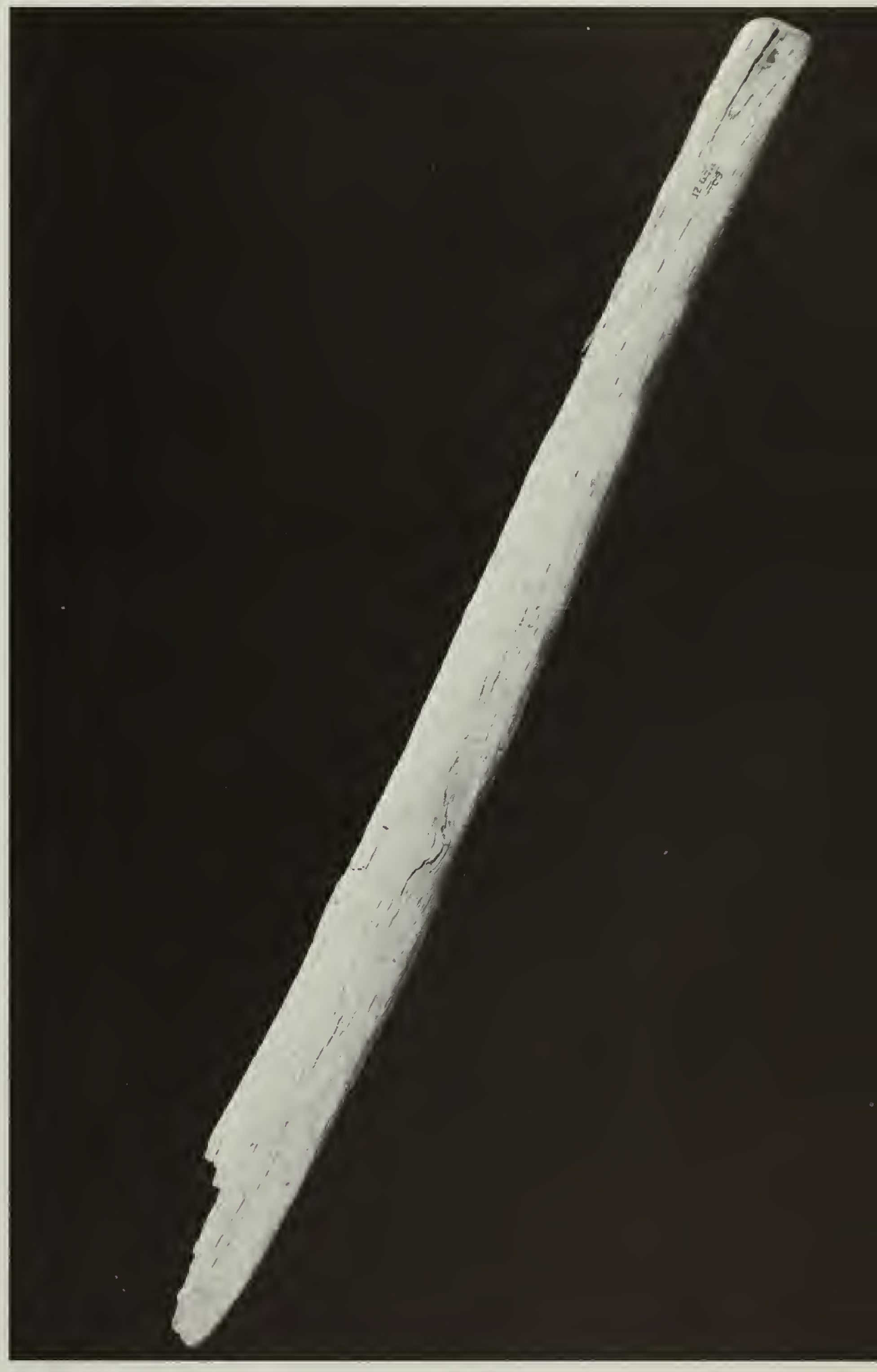
The base of a large quartzite stemmed point weighing nore than 4 gm. came from the fill of Room 77. The tem of this point expands toward the straight base and he shoulders slope inward toward the stem. This specinen certainly does not conform to the Mug House patern, and its possible significance is unknown. One point ragment is too small to permit assignment to one f the above categories.

VOODEN CLUB OR DIGGING STICK

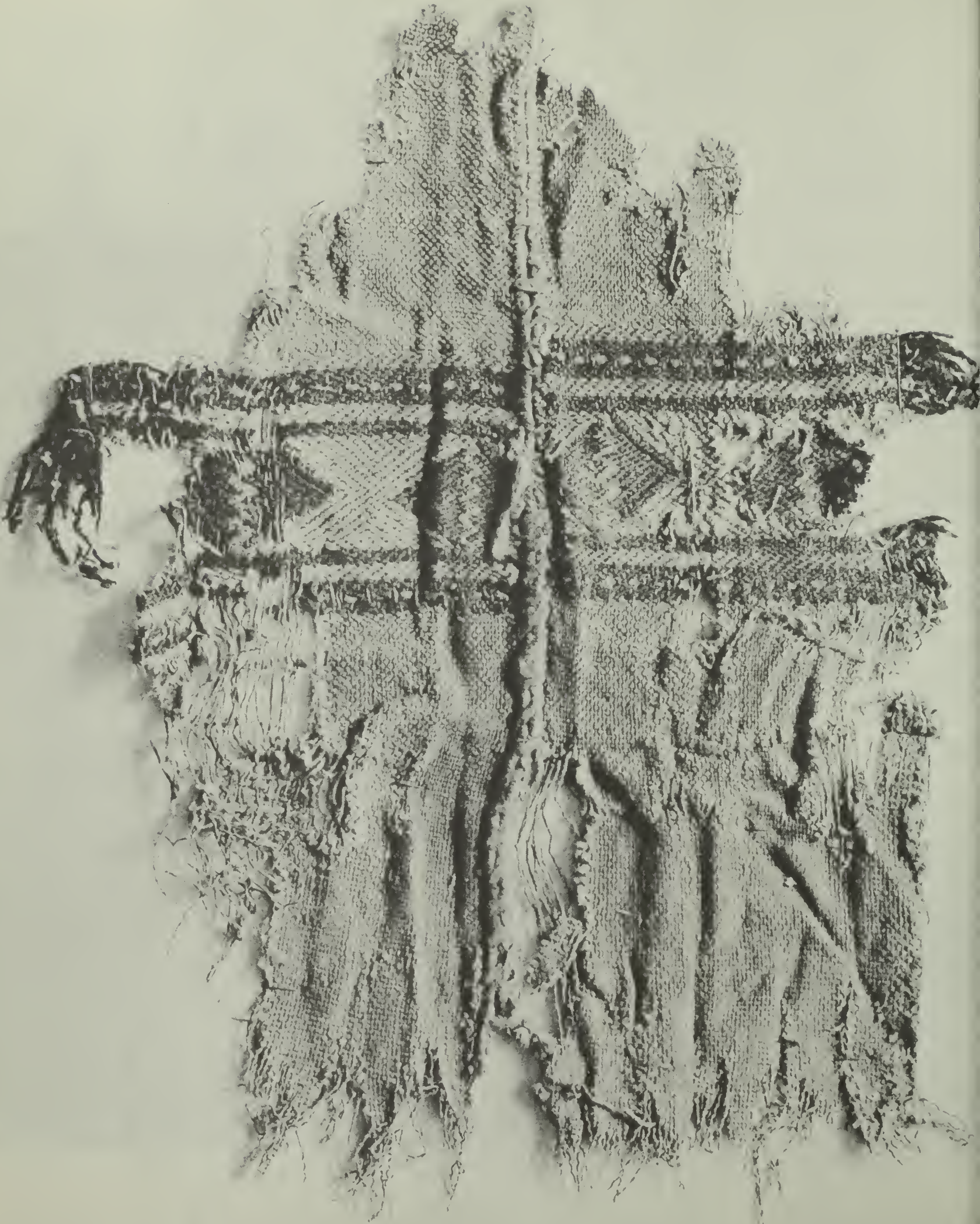
A sword-shaped oak stick, found loose on the surface, tands apart from the digging stick fragments from Mug Iouse in size and in the character of the work involved n its shaping. It is 62 cm. (24½ inches) long, between .5 and 4.5 cm. wide, and less than 2 cm. thick anywhere long its length. It had been ground into a flat ovoid ross section, wider and flatter at one end (fig. 129) 'he opposite end was abruptly cut off and ground mooth. The narrow edges of the blade are rounded and mooth. A small portion of the flat blade end was roken off.

Superficially, the blade end resembles those of digging ticks, although it is somewhat broader. It is very lightly more polished than the rest of the stick. Instead f grading into a thick, rectangular cross section, as is ypical of digging sticks, the blade seems to continue hrough the entire length of the implement. The most omfortable grip is in one hand, with the blade end eld as if it were a sword or club.

I have been unable to find any ethnographic parallels in the literature. Illustrated rabbit sticks or throwing sticks display a gentle S-curve and are usually ornamented with longitudinal grooves and paint. War clubs are generally longer and have a knot or other enlargement at the business end. There are numerous references to the dispatching of small game with undescribed clubs after the animals have become enmeshed in snares or nets. I am disposed to consider this implement such a weapon—its thin sides show a number of bruises—although the possibility that it is a specialized agricultural tool cannot be discounted.



129 Wooden club or digging stick.



CHAPTER 7

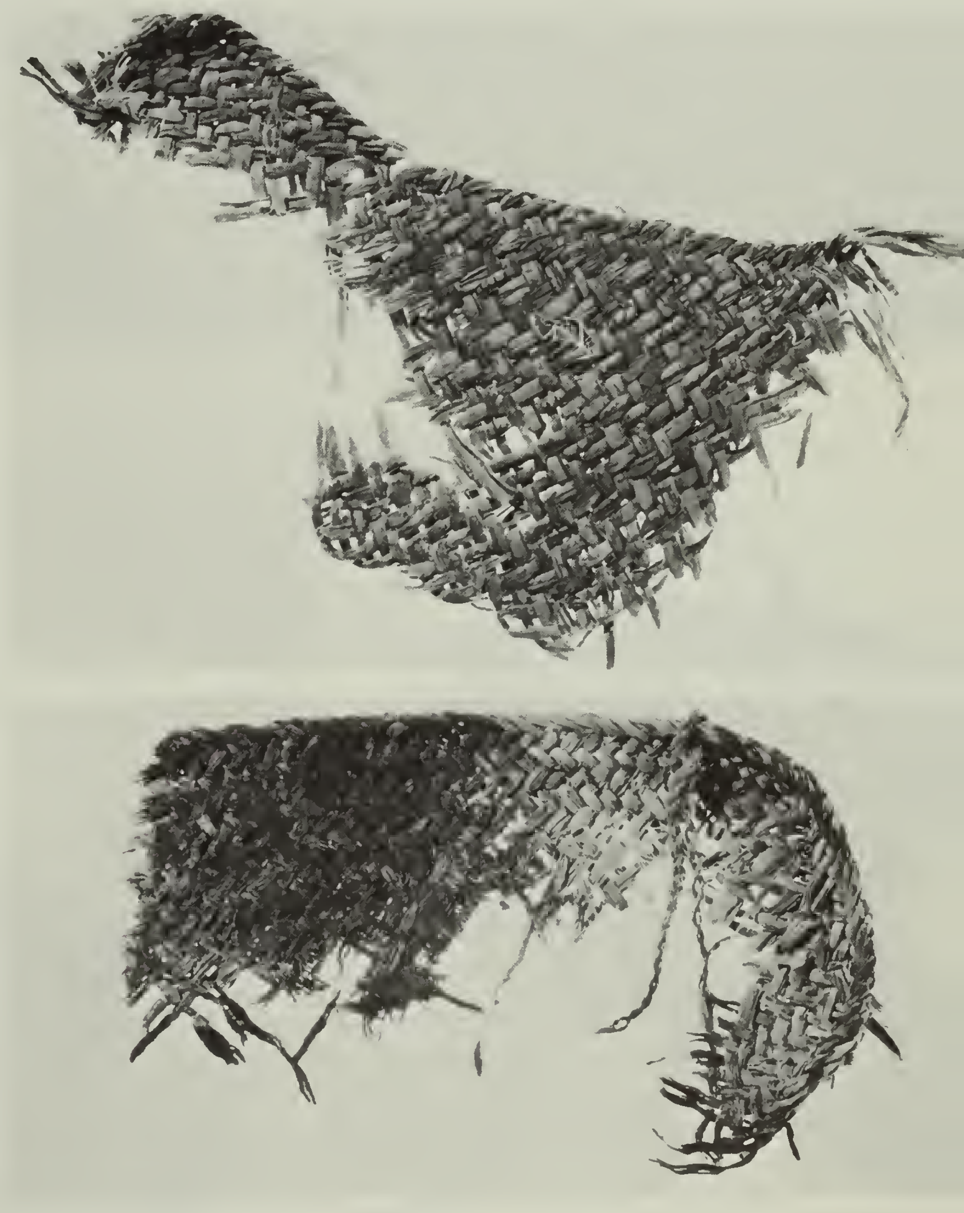
clothing and adornment

There were very few items of clothing, either whole or fragmentary, among the mass of perishable remains encountered in our excavations. The last occupants may have taken everything that was still serviceable. It is more likely, however, that previous diggers removed any reasonably complete item of apparel, since we found almost all the dry deposits disturbed by their activities. Most of the undisturbed deposits contained moisture and few whole perishable objects survived in them.

FOOTWEAR

Fragments of eight twilled yucca sandals (table 12) were taken from refuse and previously disturbed fill. To make them, 0.3- to 0.4-cm.-wide strips, split from the broad leaves of the yucca plant, were diagonally plaited, over-2 and under-2 (fig. 130). All selvages were formed by simply turning the elements under-2 and then over-2. Three preserved heels were both round and slightly turned up. The scattered remnants of ties, made of twisted yucca cordage, do not offer a clue as to how the sandals were fastened to the foot. Knots along the heel selvage indicate that manufacture either began or terminated at that end, probably the latter. The fragments show a considerable amount of wear, which reduced some of the strips to fibers and produced holes near the heels of the two larger specimens.

From rubbish near the floor of Room 31 came a small fragment of twined weaving, 3.8 cm. along the warp by 4.5 cm. along the weft. The technique of manufacture indicates that it is part of a sandal (fig. 131). Although the fragment is too fragile to dissect, a raised pattern may be discerned on one surface which is typical of twined cordage sandals in other Mesa Verde collections. Two-ply Z-twist yucca cordage, about 0.2 cm. in diameter, formed the warps which were spaced about three to the centimeter. Wefts of 2-ply S-twist cordage run eight pairs to the centimeter, and are twined with a pitch up to the right.



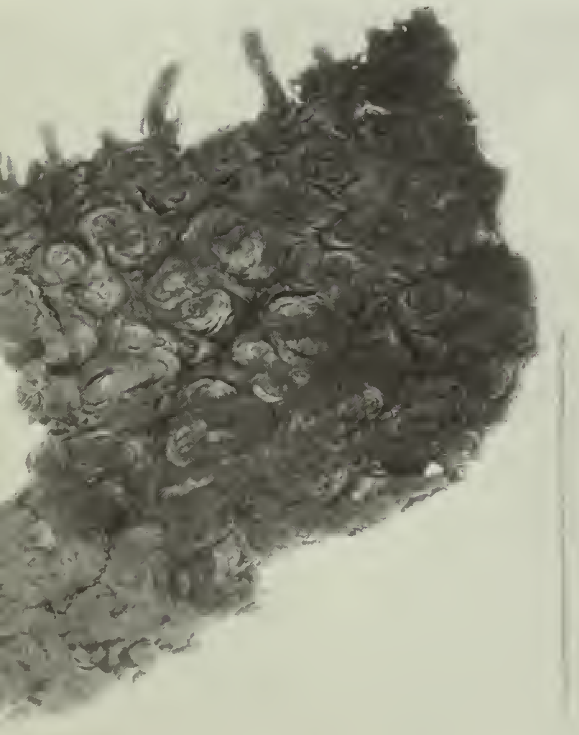
130 Fragments of twilled yucca sandals.

TABLE 12.—TWILLED SANDAL FRAGMENTS

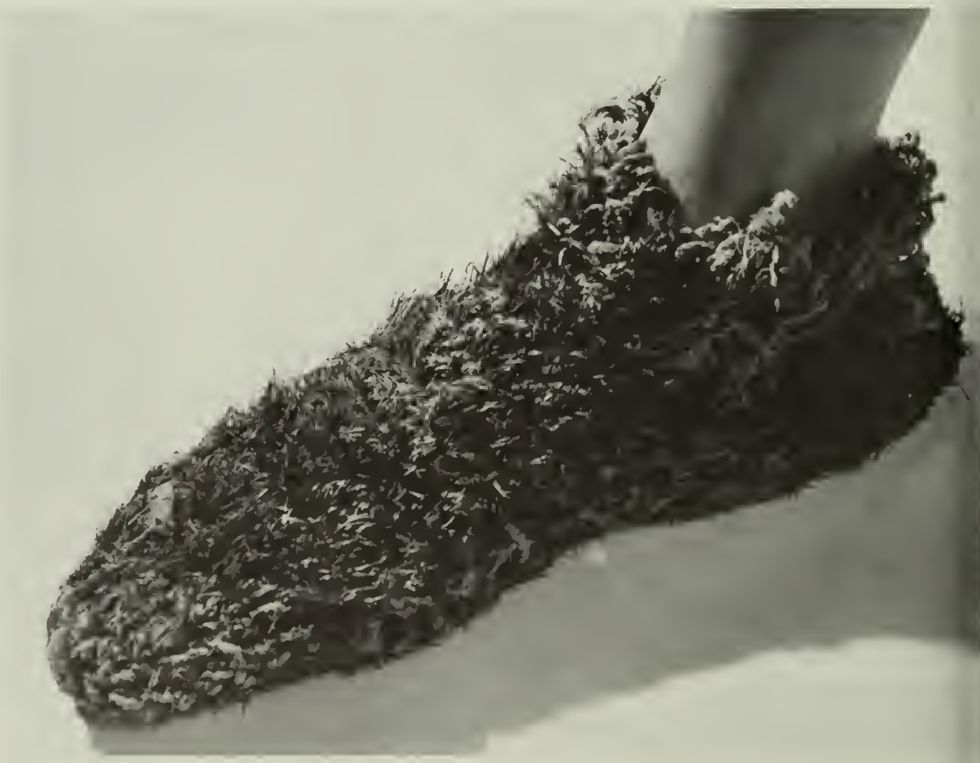
Specimen	Length (cm.)	Width (cm.)	Element width (cm.)	Selvages	Other
18188/703 (Rm. 25, floor).	>5.7	>4.0......	0.3	Part of one side (simple turning).	No knotting in fragment.
18284/703 (Rm. 29, fill).	>16.0	9.0 at heel..	0.3	Heel, right side (simple turning).	Heel tie of 2-ply Z-twist yucca cord, 0.2–0.3 cm. diam., 4.0 cm. from heel, passes through selvage—2 ends 8.0 cm. long each.
18577/703 (Rms. 55–56).	>20.0	11.0.......	0.4	Part of heel, 2 sides (simple turning).	Added elements near left selvage on under surface. Part of one fiber bundle tie on left selvage 4.0 cm. from heel.
18578/703 (Rms. 55–56).	>6.0	>5.5......	0.3	2 tiny frags. (simple turning).	
18580/703 (Rms. 55–56).	>6.0	>3.0......	0.3–0.4	Part of one side (simple turning).	Part of 2-ply Z-twist cord tie through sole with self-knot on upper surface, square knotted to yucca strip.
18687/703 (Rm. 72, fill).	>5.5	>5.5......	0.3–0.4	None...............	
19047/703 (old back-dirt over Kiva D).	>3.0	>6.0......	0.2–0.3	Part of heel (simple turning).	Two elements knotted together just below selvage.
27942/703 (Rm. 29, fill).	>5.0	>8.2......	0.3	Part of one side (simple turning ?).	

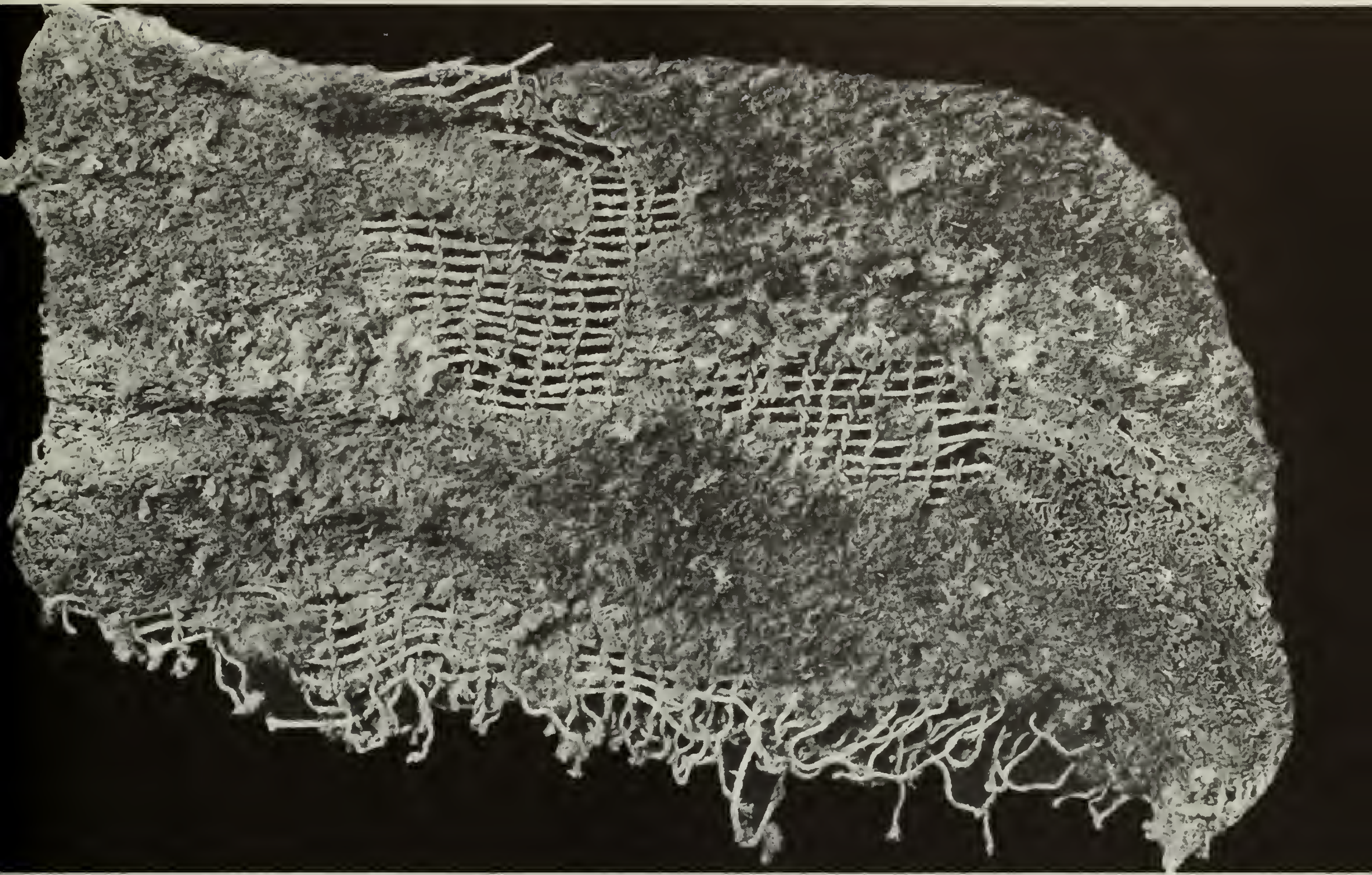
Perhaps our most exciting find in the whole realm of apparel is a virtually complete sock made by knotless netting (fig. 132). A simple looping technique was employed with 2-ply Z-twist yucca cordage into which feathers had been twisted. In the ankle section there is some mending of yucca strips and untwisted fibers. The finished product would cover a small-sized right foot and part of the ankle. It was apparently worn with a sandal, as several loop or strap impressions can still be seen. Such a feathered sock would be much too warm for wear in summer, but would be welcome covering during cold weather. The fragment of a possible mate for the left foot, largely destroyed by moisture, was found nearby. Both came from the fill of Room 44/1.

131 Fragment of twined cord sandal. Common pin for scale.



132 Feather-cord sock on model's foot.





133 Feather-cloth blanket found with Burial M2 in Adobe Cave.

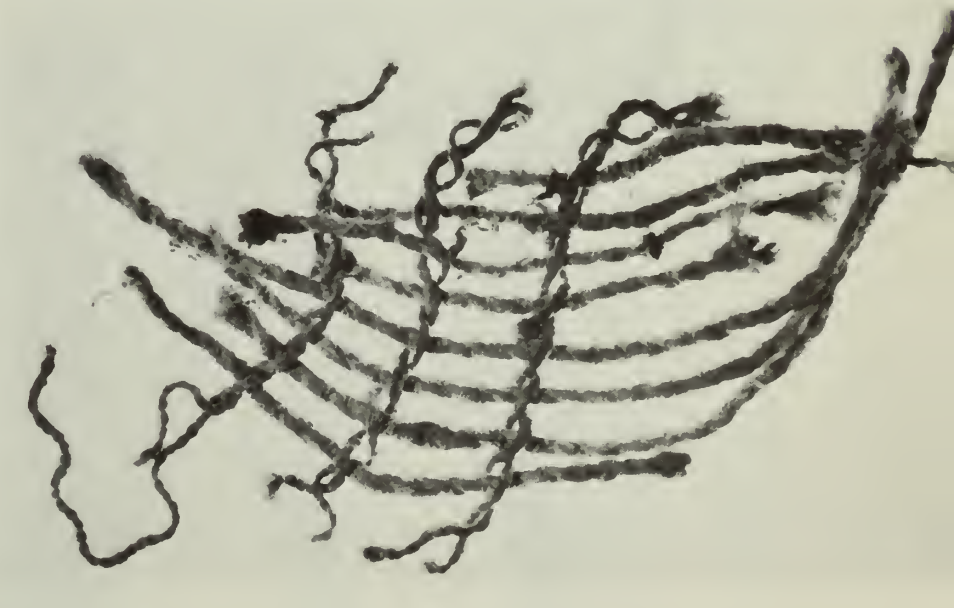
ROBES OR BLANKETS

One nearly complete feather-cloth blanket (fig. 133) was recovered from the grave of Burial M2 in Adobe Cave. Although only three selvages are present, this may represent the complete object placed in the grave. The specimen measures 89 cm. (35 inches) along the warps and 46 cm. (18 inches) across the wefts, where only one selvage remains. This blanket consists of a series of 2-ply Z-twist yucca cords, wrapped with brown and white turkey down feathers, laid side by side about 1 cm. apart, and held together by pairs of other 2-ply Z-twist yucca cords twined through them at intervals of 2 to 3 cm. The twined wefts alternate in pitch from up to the right to up to the left. Along the side selvage the wefts are simply carried around and into the second warp. At one end, the loop ends of the warps are secured by a group of three cords woven in and out in plain weave. The two colors of feathers do not form a pattern, but produce a mottled effect.

The technique used for making feather blankets can be more clearly seen in figure 134, which shows a small fragment of a blanket almost completely denuded of the feather wrappings or quills. The warp and weft employed, and the intervals between elements, are identical to those in the Adobe Cave specimen. This specimen was found in the loose fill of Kiva B in Mug House.

Large quantities of cordage similar to that in these two specimens, but with ends broken or chewed off by rodents, were found in dry deposits throughout the ruin. All individual lengths are discussed under "yucca cordage," although many of them were probably parts of feather blankets, which must have been quite common.

134 Fragment of feather cloth with most of feather wrappings destroyed.



We can only guess how feather blankets were used. Even though perishables were rarely preserved with burials, fragments of feather-wrapped cordage were found in four graves in Adobe Cave. It may well be that each individual possessed at least one such blanket, which would be worn as a robe on cold days and nights, and which eventually served as a shroud.

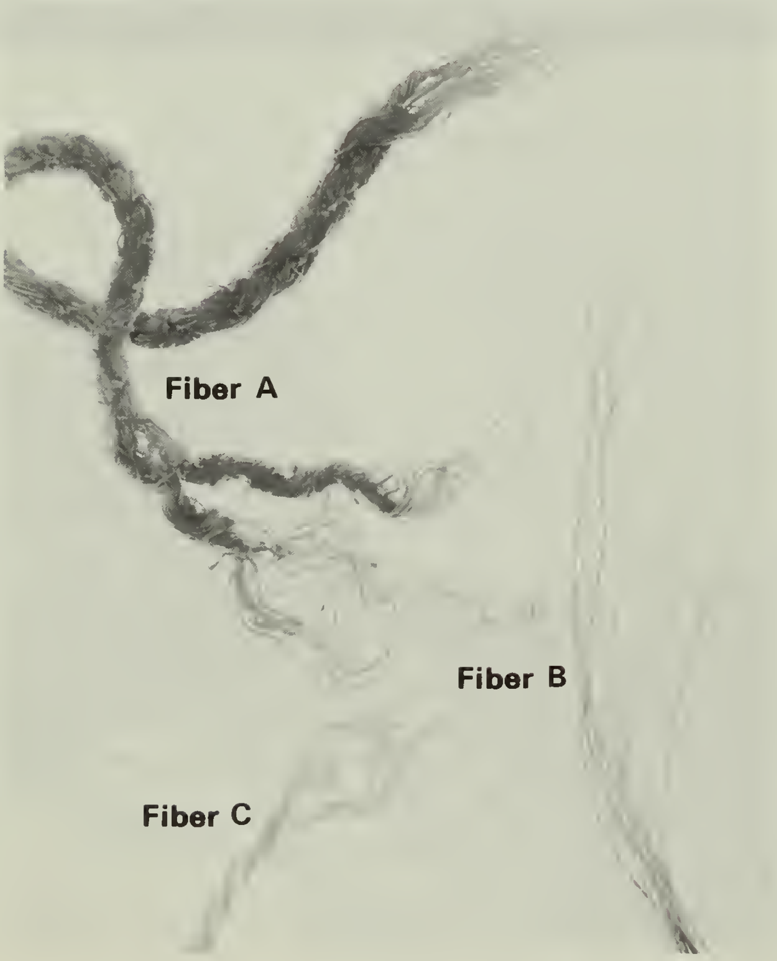
YUCCA CORDAGE

Among the more numerous perishable items we found in Mug House were free lengths of cordage. They were analyzed by Carolyn M. Osborne, and her data provide the basis for the following discussion.

There are 744 pieces of cordage that measure 115.3 meters (378 feet) if placed end to end. Excluding 33 pieces that could not be measured because of disintegration or combination with others, the average length of the fragments is 16.5 cm. (6½ inches). Apparently no one wasted twine.

For the benefit of non-specialists, *ply* refers to the single yarns twisted together to form a *plied* yarn or cord. If the elements are twisted in one direction so that the direction of slope of the spirals, when held in a vertical position, conforms to the central portion of the letter S, the cord is said to have an S-twist. If the elements are twisted in the opposite direction, the cord has a Z-twist. The term *twine* is restricted to those cords made up of two or three plies twisted together once.

135 Three types of yucca fibers used in cordage.



Fiber for the bulk of the cordage (89.5 percent) had only been incompletely separated from the fleshy pulp of the yucca leaf (fig. 135, upper left). Some of this sticky substance may actually have made twisting easier. It is dull tan or brown in color. For future reference—and in the interest of brevity—let us designate this as fiber A, to distinguish it from two other kinds of yucca fiber that seem to have been prepared in different ways, perhaps for special uses.

Fiber B will apply to the well-separated golden fibers that are completely cleared of pulp so that the individual filaments are wholly parallel (fig. 135, right).

Fiber C will refer to a soft, fuzzy yucca that can easily be confused with cotton because of its very light color. It appears to have been pounded or rubbed—possibly just between the fists—at some stage in its preparation (fig. 135, lower left).

These three fibers are clearly related to the cordage in which they were used (table 13). The less common twines usually contain the less common fibers B and C. The few examples of 1-ply yarns have no significance since they probably represent separated cordage.

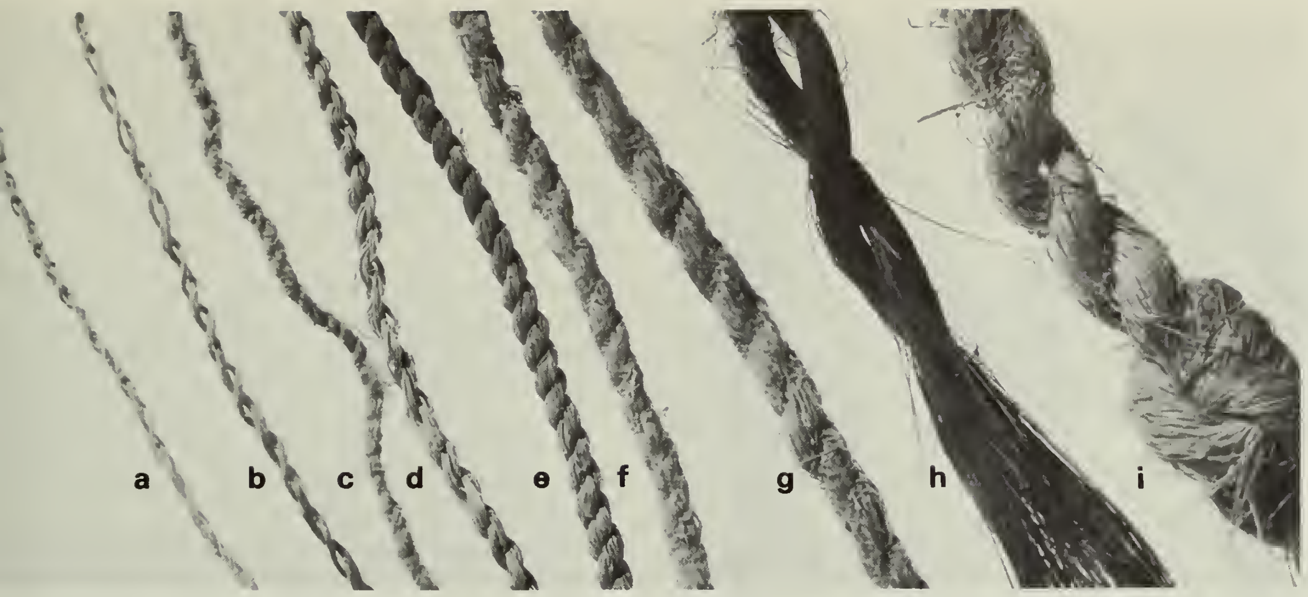
The commonest twine (79 percent) is 2-ply Z-twist, between 0.2 and 0.5 cm. in diameter, hard twisted, of the dull tan or brown fiber A (fig. 136d–f). Most of the feather- and fur-wrapped cordage belongs to this type, and tends toward the greater diameters (fig. 137). The uniformity of twist, both in diameter and in degree, is so great in this twine that we can assume the motor habits of manufacture were usually quite constant. There is a wide variety of 2-ply twines with Z-twist, however (fig. 136). Fibers B and C appear only in the thinner and thicker extremes.

TABLE 13.—YUCCA FIBERS IN CORDAGE

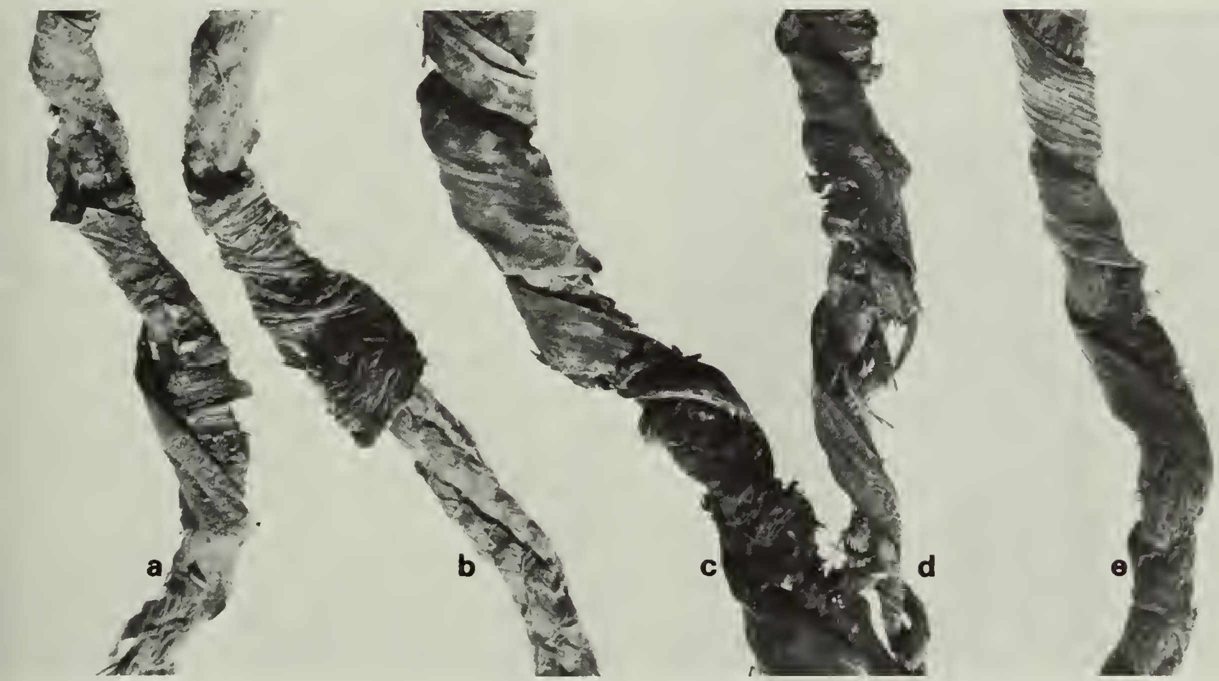
Type of cord	Fiber A	Fiber B	Fiber C	Totals
1-ply Z-twist	1	1	2	4
1-ply S-twist		1		1
2-ply Z-twist (plain)	377	39	5	421
2-ply Z-twist (feather-wrapped)	174			174
2-ply Z-twist (fur-wrapped)	32			32
2-ply Z-twist (fur and feather)	3			3
2-ply S-twist	19	16	16	51
3-ply Z-twist	2	12		14
3-ply S-twist	1	11		12
4-ply S-twist	1			1
Multi-twist (2-ply)	21	4		25
Multi-twist (3-ply)	3	1		4
Multi-twist (other)	2			2
Totals	636	85	23	744

Two-ply S-twist twine was made from all three fibers in almost equal amounts (fig. 138). It, too, shows a considerable size range. Three-ply twines employed fiber B almost exclusively.

Multitwist Cords. Only 4 percent of all the yucca cordage was made in several stages of twisting, but there

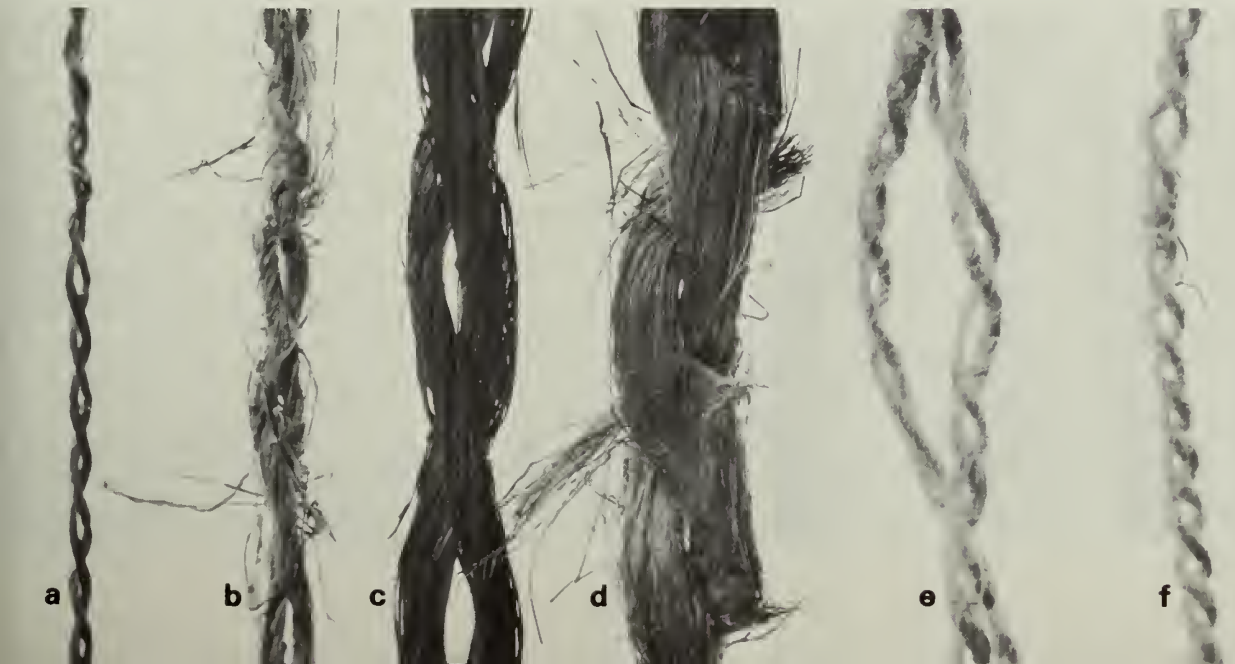


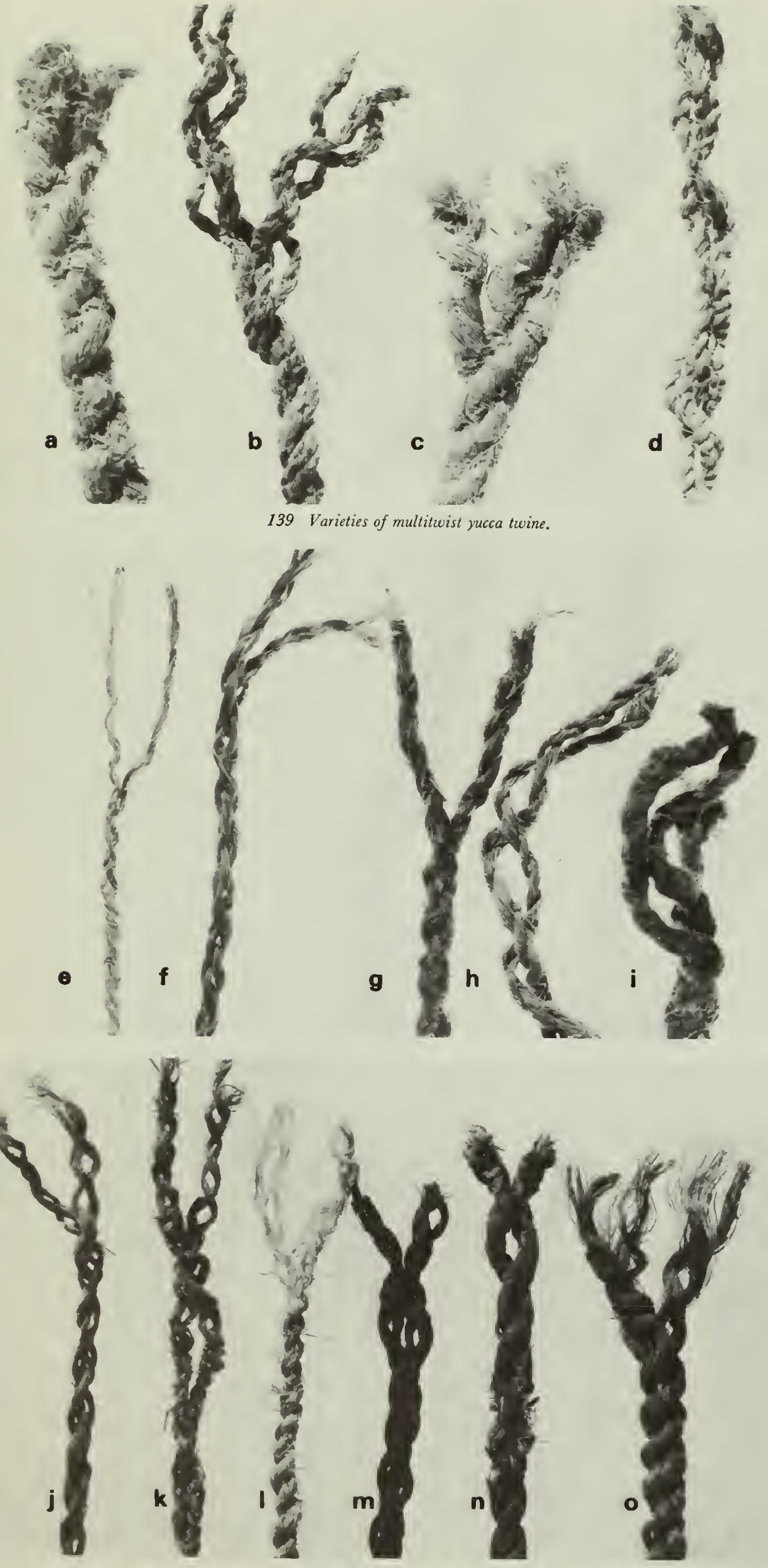
6 *Varieties of 2-ply Z-twist yucca twine.*



7 *Feather-wrapped 2-ply Z-twist yucca twine.*

8 *Varieties of 2-ply S-twist yucca twine.*





139 Varieties of multitwist yucca twine.

are many varieties (fig. 139). For multitwist cords, the symbol for direction of twist of the single yarns is given first, with each subsequent direction following in order. Each stage of twisting always combined at least two smaller elements. Thus, a cord designated as Z-S-Z uses four Z-twist single yarns twisted together in pairs to form two 2-ply S-twist twines, which are then plied together in a Z-twist.

Final plying never involved more than three elements. Cable twists—those with successive twists in opposite directions, producing a corrugated surface (fig. 139e–o)—outnumber Hawser twists—those with two successive twists in the same direction, producing a smoother surface (fig. 139a–d)—by 3 to 1. These more elaborately twisted cords have not survived in any greater lengths than the more common twines.

Cord Making. There is a paucity of materials from Mug House that might represent the making of cordage. Without doubt, the various post-human rodent occupants of the cave have influenced the evidence left to us. Wood rats would likely have eaten any fresh yucca leaves a cordage maker might have stockpiled and then left behind. Even if some unpulped leaves had been left in one of the rooms, I am not sure we could have distinguished them from those brought in by the rodents.

Deriving fibers from yucca leaves can be done quickly and easily. Carolyn Osborne (1965) achieved results in our laboratory similar to those of the prehistoric people by using humerus scrapers, stone flakes with sharp edges, and large waterworn cobbles. The leaves were placed on the cobbles and scraped with either one of the other kinds of tools. Fewer fibers broke when the bone scrapers were used and the leaves had been soaked in water for some time. The waste pulp with some broken fibers tended to ball up into lumps remarkably like the so-called quids.

Because water usually had to be hauled into Mug House, one wonders if much of the pulping of yucca leaves was done outside the village at the water supply, where the discarded waste materials would soon have disintegrated. We did find many yucca "quids" in Mug House, however.

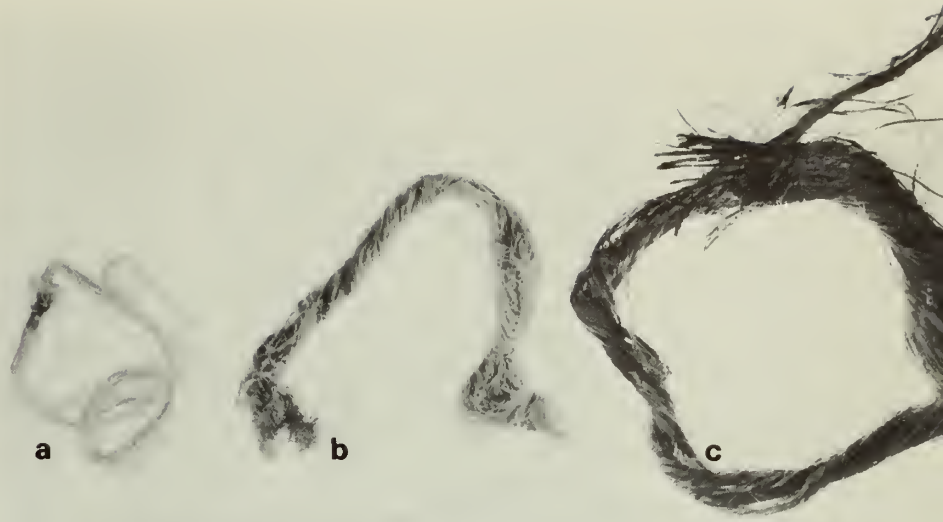
Nine bundles of prepared fibers, all small, were found. The largest (fig. 140c), measuring about 48 cm. (19 inches) long and 1 cm. in diameter, would represent the fibers of no more than two leaves of the broad-leafed yucca (*Yucca baccata* Torr.). Parts of the leaf bases are still visible. Most of these fiber bundles are loosely held by an overhand knot, or are unsecured. One unusual bundle (fig. 141) consists of well-separated B fibers folded into a bundle and wraped with additional fibers and a length of 2-ply S-twist twine made from them.

Seventeen specimens were found that seem to represent the beginnings of twisting. They start with a few untwisted or barely twisted fibers that soon form a fine 2-ply twine and, in several cases, proceed into a 3-ply twine of slightly greater diameter (fig. 142a). Once the diameter and degree of twist met the maker's specifications, these beginnings were apparently discarded.

All the twine beginnings are of the unusual fiber B.

TABLE 14.—YUCCA CORDAGE, CLASS A FIBER

Type of cord and diameter in cm.	Total number of lengths	Crepe	Degree of twist			
			Hard	Medium	Loose	Not recorded
2-ply Z-twist:						
<0.1	3	....	3	....	....	....
0.1–0.4	254	1	207	42	1	3
0.4–0.7	113	....	94	18	1	....
>0.7	7	....	4	2	1	....
2-ply S-twist:						
<0.1	6	....	....	5	....	1
0.1–0.4	13	....	3	2	7	1
0.4–0.7	3	....	....	1	2	....
>0.7	1	....	....	1	....	....
3-ply Z-twist:						
0.1–0.4	2	....	1	....	....	1
3-ply S-twist:						
0.1–0.4	1	....	....	....	1	....
4-ply S-twist:						
0.4–0.7	1	....	....	1	....	....
2-ply Z-twist (feather-wrapped):						
0.1–0.4	73	....	58	15	....	....
0.4–0.7	101	....	86	15	....	....
2-ply Z-twist (fur-wrapped):						
0.1–0.4	20	....	12	8	....	....
0.4–0.7	12	....	8	4	....	....
2-ply Z-twist (feather and fur):						
0.1–0.4	2	....	1	1	....	....
0.4–0.7	1	....	1	....	....	....
2-ply S-Z-S (feather and fur):						
0.1–0.4	1	....	1	....	....	....
3-ply S-Z-S:						
0.4–0.7	1	....	....	....	1	....
Multitwist cable, 2-ply S-Z-S:						
0.1–0.4	2	....	....	2	....	....
0.4–0.7	5	....	2	....	3	....
Cable, 2-ply Z-S-Z:						
0.1 -0.4	4	....	2	2	....	....
0.4–0.7	5	....	4	....	....	1
>0.7	1	....	....	1	....	....
Semihauser, 2-ply S-Z-Z:						
0.1–0.4	1	....	1	....	....	....
>0.7	2	....	1	1	....	....
Hauser, 2-plv S-S-Z:						
>0.7	1	....	....	1	....	....
Cable, 2-ply S-Z-S-Z (8 and 12 singles):						
>.07	2	....	2	....	....	....
Semihauser, 2-ply S-Z-S-S:						
0.4–0.7	1	....	....	1	....	....
Cable, 2-ply S-Z-Z-S:						
0.4–0.7	1	....	....	....	1	....
Cable, 3-ply S-Z-S:						
0.4–0.7	1	....	1	....	....	....
Cable, 3-ply Z-S-Z:						
0.1–0.4	1	....	....	1	....	....
Hauser, 3-ply S-S-Z:						
>0.7	2	....	....	2	....	....
Class A totals	644	1	492	126	18	7



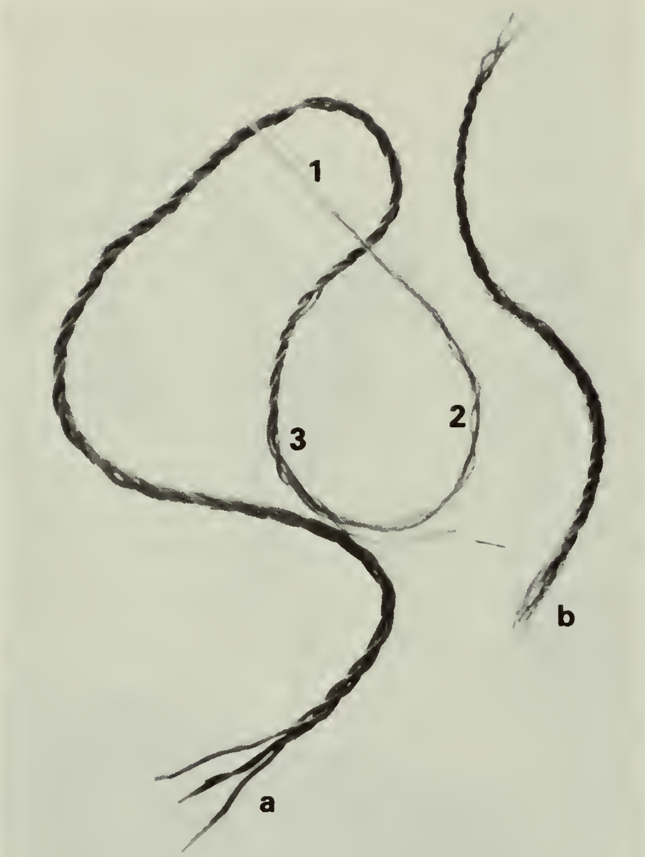
140 Yucca-fiber bundles prepared for spinning.

141 Wrapped yucca-fiber bundle. Divider points are 1 inch apart.

Is it possible that they do not represent beginnings of twine making, but were made for some special purpose? Similar tapered twine ends may be seen in some sandal ties where the tapering may have facilitated insertion into woven sandals. Most of these specimens came from Rooms 11, 25, and 26.

We can only speculate as to how the Muguenos twisted fibers into cordage. It is probably safe to assume that fibers were rolled along the thigh while one end of them was held fixed, as is so common among many primitive peoples. When two single plies were combined into a 2- or 3-ply twine, the direction of twist was always reversed. Thus, 2-ply Z-twist twine invariably contains S-twist single plies.

In the simple forms of twine, those with only one plying twist, the preferred diameter was between 0.1 and 0.4 cm. (table 14). The twine was twisted hard, although as the diameter increased beyond 0.7 cm., this became more difficult to accomplish. Both fibers B and C are exceptional, however (table 15). All lengths of the soft, white C fiber group measure 0.4 cm. in diameter or less, yet are just as often twisted to a medium as to a hard degree. Although 92 percent of the well-separated, gold B fiber lengths fall in this same size range, they are more often twisted to a medium (46 percent) or loose (23 percent) degree than any other twine. This lesser degree of twist may result from the non-clinging character of the fiber, or it might reflect



142 Yucca twine in 1-, 2-, and 3-ply patterns (a), and 3-ply Z-twist yucca twine (b).

TABLE 15.—YUCCA CORDAGE, CLASS B AND C FIBERS

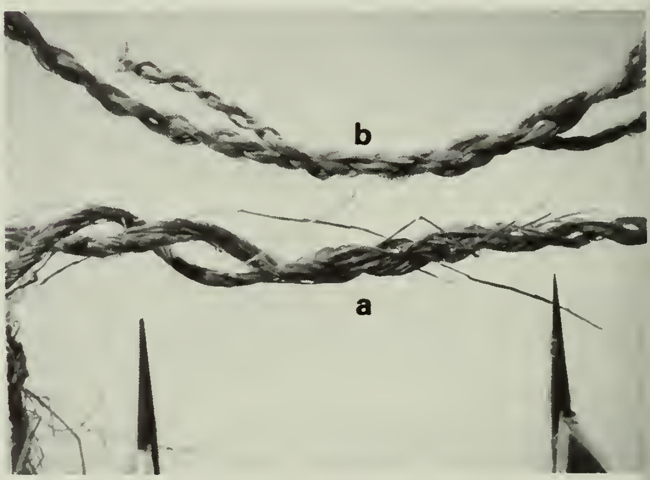
Type of cord and diameter in cm.	Total number of lengths	Crepe	Degree of twist: Hard	Medium	Loose	Not recorded
CLASS B FIBER						
2-ply Z-twist:						
<0.1	5	....	2	3	....	....
0.1–0.4	30	....	14	13	3	....
0.4–0.7	4	2	2	....	....	....
2-ply S-twist:						
<0.1	4	....	....	2	....	2
0.1–0.4	10	....	2	3	5	....
0.4–0.7	2	....	....	2	....	....
3-ply Z-twist:						
<0.1	1	....	1	....	....	....
0.1–0.4	11	....	1	10	....	....
3-ply S-twist:						
0.1–0.4	11	....	2	3	6	....
Class B totals	78	2	24	36	14	2
CLASS C FIBER						
2-ply Z-twist:						
<0.1	1	....	....	1	....	....
0.1–0.4	4	....	3	1	....	....
2-ply S-twist:						
0.1	4	....	3	1	....	....
0.1–0.4	12	2	2	7	1	....
Class C totals	21	2	8	10	1	0

its intended use. Fiber B twines often appear as warps in woven sandals and bands where the looser twist as well as the smoother fibers would facilitate the close packing of wefts.

Occasionally, plies were added after the twine had been formed (fig. 143b). In both recorded specimens, the new ply was itself 2-ply when added, but it gradually lost its identity as it merged with the main body of twine. There is also one clear instance where a single ply was doubled on itself and twisted, starting at the fold. On a specimen from Room 7 (fig. 143a), the direction of twist was reversed. Below the arrow is 2-ply S-twist twine, above it 2-ply Z-twist. The transition was accomplished by drawing one ply through the fibers of the other.

Uses. Cordage had a great variety of uses in Mug House. Large quantities of 2-ply Z-twist twine about 0.4 to 0.5 cm. in diameter were wrapped with strips of animal fur or the split down feathers of turkeys and made into blankets or robes. Wrapping always ran counter to the Z-twist of the twine. The tip of one split quill overlapped the thick, hard base of its predecessor. Dark-colored down predominates over light-colored down, but both occasionally appear in the same object. Apparently paint spots on some twine marked places where down colors should change.

In the Colorado State Museum's Mesa Verde collections, a small complete feather blanket measuring 23½ by 19½ inches contains close to 137½ feet of feather-wrapped twine in its warps and just over 64 feet of plain twine in its wefts. (This specimen is not from Mug House.) Although feather- and fur-wrapped pieces account for more than one-fourth of all cordage recovered from Mug House, all of them combined would reach only about 98 feet. Several pieces of the thinner twine retain impressions of their former position as wefts in these blankets.



143 Change from S- to Z-twist in yucca twine, and addition of a third ply in yucca twine (b). Divider points are 1 inch apart.

Fur-bearing skin of rabbits was usually cut into strips 0.3 to 0.4 cm. wide for wrapping around cordage. These strips were also wrapped in the S-direction opposite to the twist of the twine. Several lengths of cordage are wrapped with both turkey feathers and rabbit-fur strips.

Yucca twine also appears as wefts in reed matting and as the sewing element in willow mats. Fine cordage was used to sew leather and cloth. Cordage also served to tie or wrap bundles, such as a bundle of sinew or sticks or a yucca pot rest; to fasten separate items together, such as the parts of a wooden cradle, a bark container, and the like; to mend cracked pottery; and to provide strings for beads and other jewelry. Some of the heavier cords may have been tumplines or small ropes for suspension of objects in the rooms.

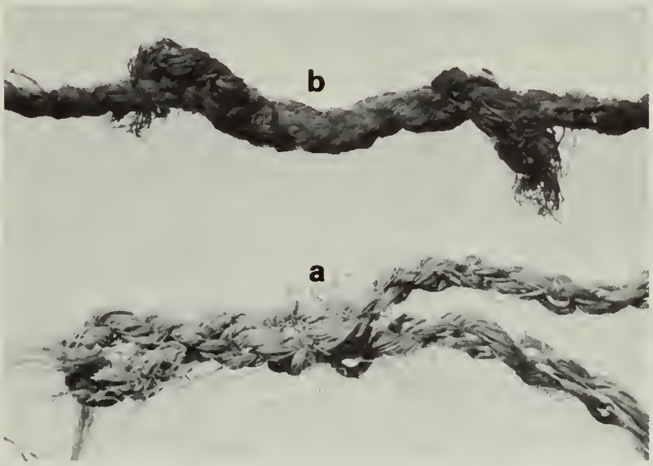
It seems likely that cordage made from fibers B and C was intended to be woven into objects such as cord sandals, tumpline headbands, belts, and so forth. Fiber B twine appears as warps in most of these objects, while fiber C often shows up in the weft. Maybe this explains why the two fibers were prepared differently from the more common A fiber. Because of its resemblance to cotton yarn, one is tempted to think that fiber C cordage might have been twisted on a spindle rather than rolled along the thigh, although there is no evidence to support or refute this idea.

The proveniences of cordage lengths made from fibers B and C reveal several distinct concentrations, which may or may not reflect some specialization in cordage manufacture at Mug House. Nine lengths of fiber B cordage and five of fiber C came from Rooms 11 and cordage and five of fiber C came from Rooms 11 and 12. Only five other pieces like these were found on the entire upper ledge, and two of them may have originated in one of those two rooms. Twenty-one lengths of fiber B cordage came from Rooms 25 and 26. The pieces from Room 26 probably spilled out of Room 25 after the wall common to both rooms had fallen. Since Room 25 was probably associated with buildings on the upper ledge, one person or a small group of closely related individuals could have produced nearly half of all the cordage using fibers B and C that we recovered from Mug House.

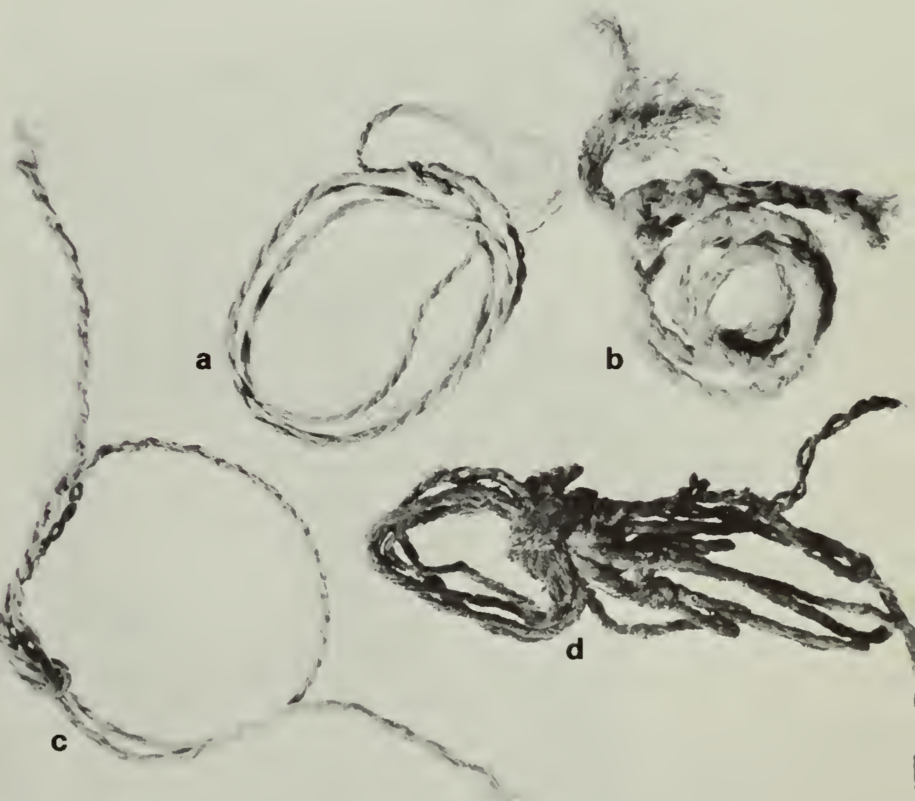
A second concentration of these two fiber classes centers on Kiva B. Twenty-two lengths of B fiber cordage and 13 lengths of C fiber came from the rooms belonging to Courtyard Unit B. This same area produced a woven tumpline band and the only fragment of a twined cordage sandal from the entire site. Again, one or a few specialists could have produced all these specimens.

We cannot overlook the vagaries of preservation in these distributions, however. No cordage was found in Courtyard Unit G (except for Room 23) or in any of the structures across the front of the cave where they were exposed to the weather. But several room blocks did yield quantities of cordage, little or none of which was made from fibers B or C: Suites 1, 10/1, 19, 42/1, 45/2, 46/2, and Rooms 47 through 53. The scattered finds there of these less common fibers, a total of only seven lengths, could all represent exchange pieces. Neither of the two rooms in which probable loom loops were found (Rooms 9 and 45/2) coincides with concentrations of B and C fiber cordage, although both contained dry fill. The disturbances of past excavations probably also took their toll, since we have no way of knowing how much material had been removed from Mug House prior to our work, precisely where it came from, or how much fill was redeposited from room to room. These disturbances would likely have dispersed the materials rather than concentrated them. Fragmentary lengths of cordage are absent from the early collections.

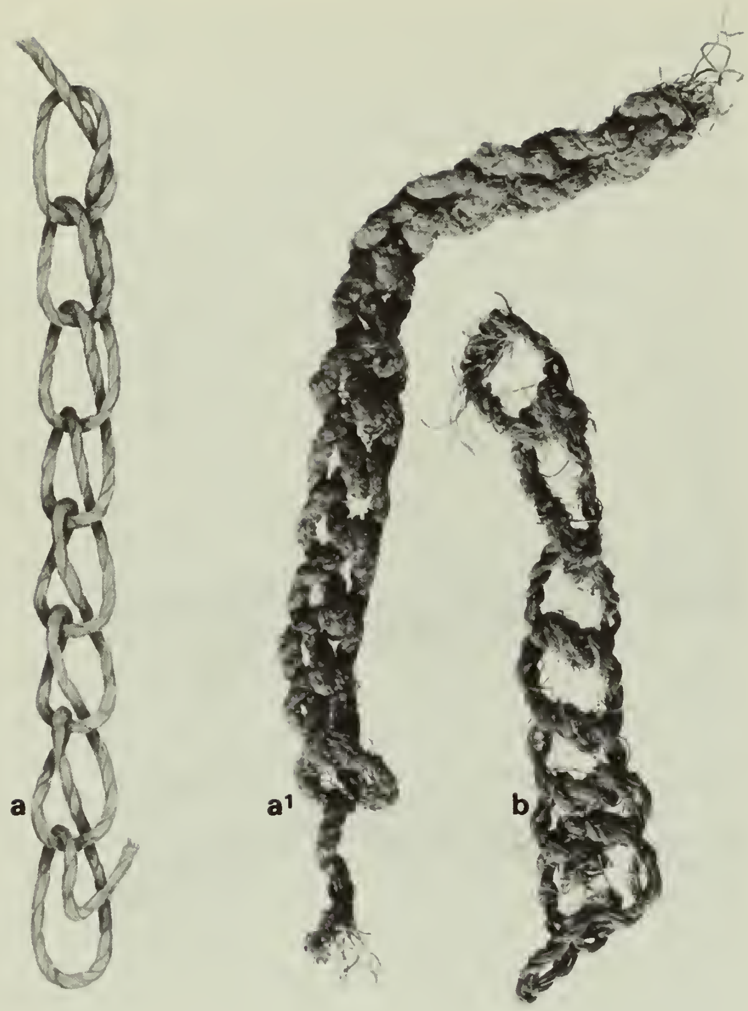
Several specialized practices seen on some specimens may indicate use in particular objects no longer recognizable. For example, one eye loop secured by splicing the plies (fig. 144a) may have been needed in a crucial spot in a snare, whereas another held by a knot (fig. 145d) might simply have provided a point of attachment on some kind of rigging. Two pieces of cord are usually tied together, unless there is need for the finished product to run smoothly, and then the two ends are spliced together (fig. 144b). There is one piece of single-strand looping (fig. 146a), and a simple chain of two strands twisted at intervals (fig. 146b).



144 Spliced lengths of yucca twine. a, Eye loop formed; and b, ends spliced together.

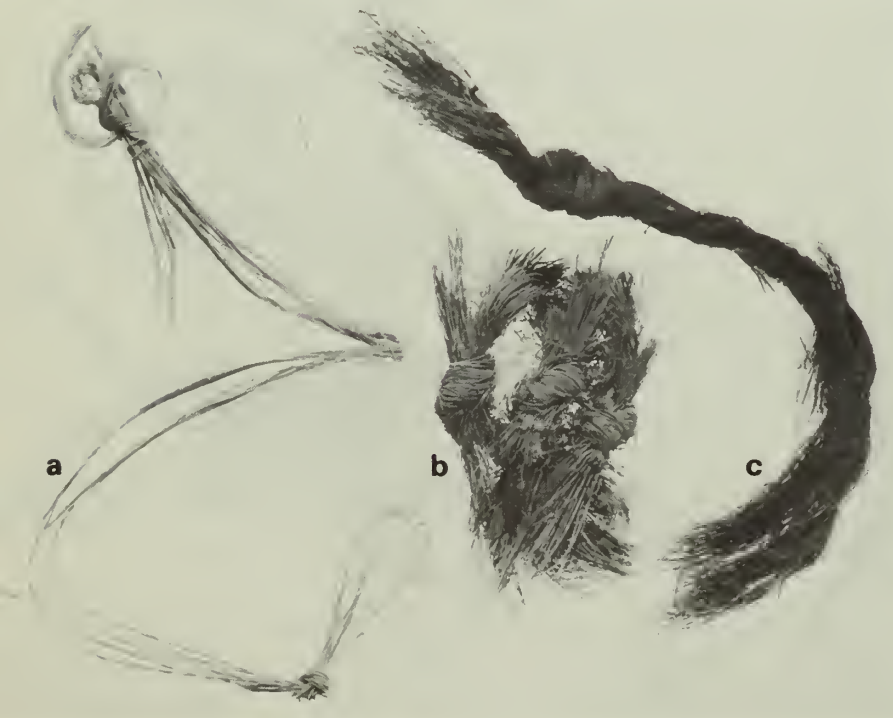


145 Wraps and knots of yucca twine. One (d) has an eye loop.



146 Single-strand looping (a, and a¹) and simple chain of two strands twisted at intervals (b).

147 Lengths and bundles of unspun yucca fiber.



Untwisted fibers may occasionally have been used in lieu of cordage. One group of well-separated fibers is knotted into an eye loop on one end and simply knotted at the other (fig. 147a). Three small fiber bundles, each tied in an overhand knot, appear to cross each other above and below the knots (fig. 147b). This and a three-strand braid of untwisted fibers (fig. 147c) could simply be fiber bundles held for stock, or they could be fragments of some objects that have been largely destroyed.

The bits of twine from Mug House are uniformly short. Since a large proportion of the lengths of cordage came from rodent nests and areas of their activity, many of the ragged ends probably resulted from gnawing by rodents. All of the wood rat nests we cleared out of the ruin contained many pieces of cordage nearly equal in length, as if they had been selected in much the same manner as the sticks and yucca leaves that made up the bulk of the nests. Consequently, relatively long pieces of twine are rare in our collection. Table 16 lists all pieces over 45 cm. (17¾ inches) in length. The longest is about 106 cm. (42 inches).

Even if we can blame rodent activity for many of the short lengths of cordage and for the absence of obvious raw material, and even though masses of cordage and its byproducts did not survive exposure to moisture or removal by earlier diggers, we are still left with a feeling of poverty. Scraps of cordage not found in rodent nests were also short. There were no balls of prepared twine awaiting use. Almost all the lengths appear to have been used at least once, and the many instances of knotting two pieces together suggest that shorter broken pieces were saved.

COTTON CLOTH

We found among the dry refuse and disturbed deposits of Mug House nine pieces of plain weave (over-1,

TABLE 16.–TWINES OVER 17 INCHES (45.0 cm.) IN LENGTH

Length (cm.)	Fiber	Type	Diameter (cm.)	Degree of twist
18″—45.0......	B..........	2–S	0.1–0.4...	Loose.
45.0......	A, fur and feather.	2–Z	0.4–0.7...	Hard.
46.0......	B..........	2–Z	0.4–0.7...	Do.
46.0......	A..........	2–Z	0.1–0.4...	Do.
20″—49.5......	B..........	2–Z	0.1–.04...	Medium.
50.0......	A, fur......	2–Z	0.1–0.4...	Do.
51.5......	B..........	2–Z	0.1–0.4...	Loose.
53.0......	A..........	2–Z	0.1–0.4...	Hard.
24″—61.1......	A, fur and feather.	3–S–Z–S	0.4–0.7...	Medium.
64.0......	A..........	2–Z	0.1–0.4...	Hard.
65.5......	A..........	2–Z	0.1–0.4...	Do.
36″—93.5......	B..........	2–S	0.1......	Medium.
40″—102.5.....	A, feather..	2–Z	0.1–0.4...	Hard.
42″—106.0.....	A..........	2–Z	0.1–0.4...	Hard.

under-1) cotton cloth (fig. 148; table 17). One fragment bears two red stains, possible remnants of some painted decoration. Selvages are present on several specimens but never on opposite sides, and thus it is impossible to tell the size of the original woven pieces. The widest fragment measures 43 cm. (17 inches), so the material must have been at least that wide when originally woven on the loom. The longest piece (fig. 149) measures 75 cm. (29½ inches). All these fragments are small enough to have been woven on a belt loom.

Although the weft yarns are consistently thicker and less tightly spun than the warp yarns, only one textile appears to have been a weft face. Three are clearly square count, that is, they have the same number of warps and wefts per inch. The various selvages described in table 17 are always executed with multiply cotton cordage larger than either the warps or wefts.

We cannot tell from these fragments just what kinds of objects were made of cotton cloth. Perhaps, as among ome of the historic Pueblo Indians, they included robes, ashes, kilts, and bags. However, Nordenskiöld found a reasonably complete specimen during his 1891 work in Mug House and his illustration is reproduced in figure 150. The following description is based on direct observaion of the specimen made by Charlie Steen, National Park Service archeologist, and on an examination of Nordenskiöld's (1893, pl. L) illustration of the specimen by Carolyn Osborne.

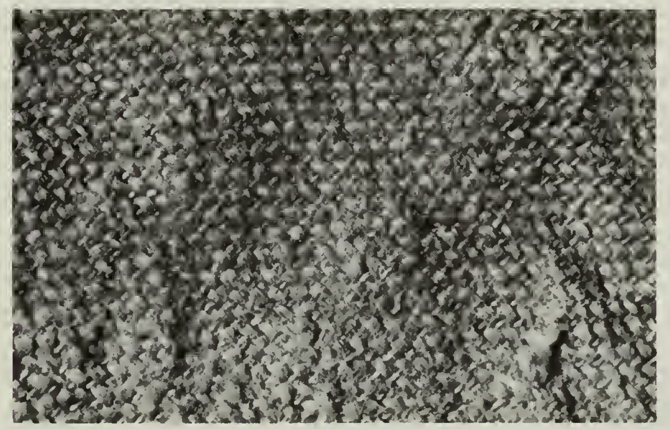
The item was apparently woven as a single piece of cloth about 31 cm. (12¼ inches) wide and in excess of 30 cm. (11¾ inches) in length. Neither of the end selvages has been preserved, but the two side selvages were rolled and whipped with cotton yarn, then whipped together with a heavy soft cotton yarn to form a tube. One end of this tube may have been closed to form a long narrow bag. The decoration appeared in a wide band of over-2, under-1 twill in an otherwise square count, plain weave textile. The wider, central band is a diamond twill with adjacent brown and white wefts, apparently turning on a common warp. The alternating narrow bands of white and brown all have a pitch up and to the right except the topmost white band, in which the pitch reverses direction. The white stitches in the narrow, brown bands and the white zigzag in the brown diamonds are embroidered, with the zigzags following the twill lines almost perfectly in overlying brown wefts.

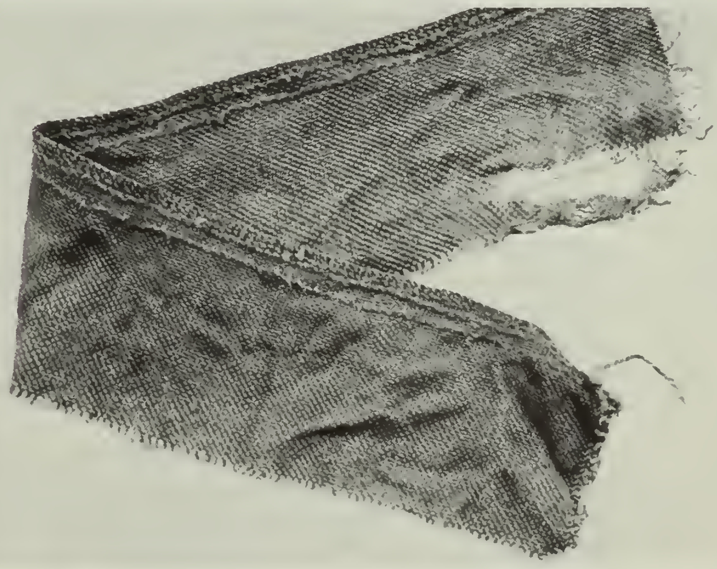
COTTON YARN

Most, but not all, free lengths of cotton yarn came from textiles. Twenty-two fragments of single-ply, medium to hard Z-twist yarn, from the rubble fill of Kiva C and several adjoining rooms, were once part of one or more textiles. They all retained undulations acquired from weaving. Nine other plied yarn pieces are like the yarns found in stitching on both textiles and fragments of leather (fig. 151a–c). There are six lengths of 2-ply Z-twist yarn, one of 3-ply Z-twist, and two multitwist Z-S-Z cord.

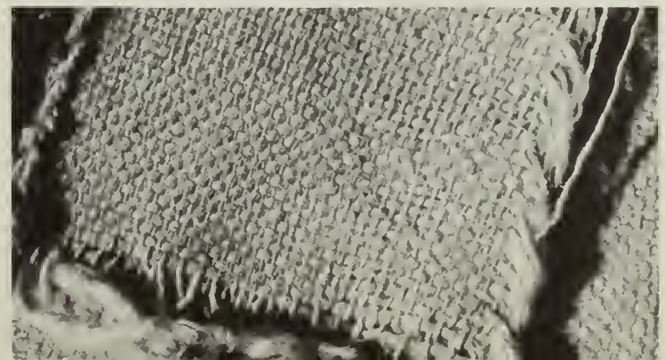
One piece of 2-ply Z-twist yarn has two others looped around it and twisted counterclockwise (Z-twist) to hold

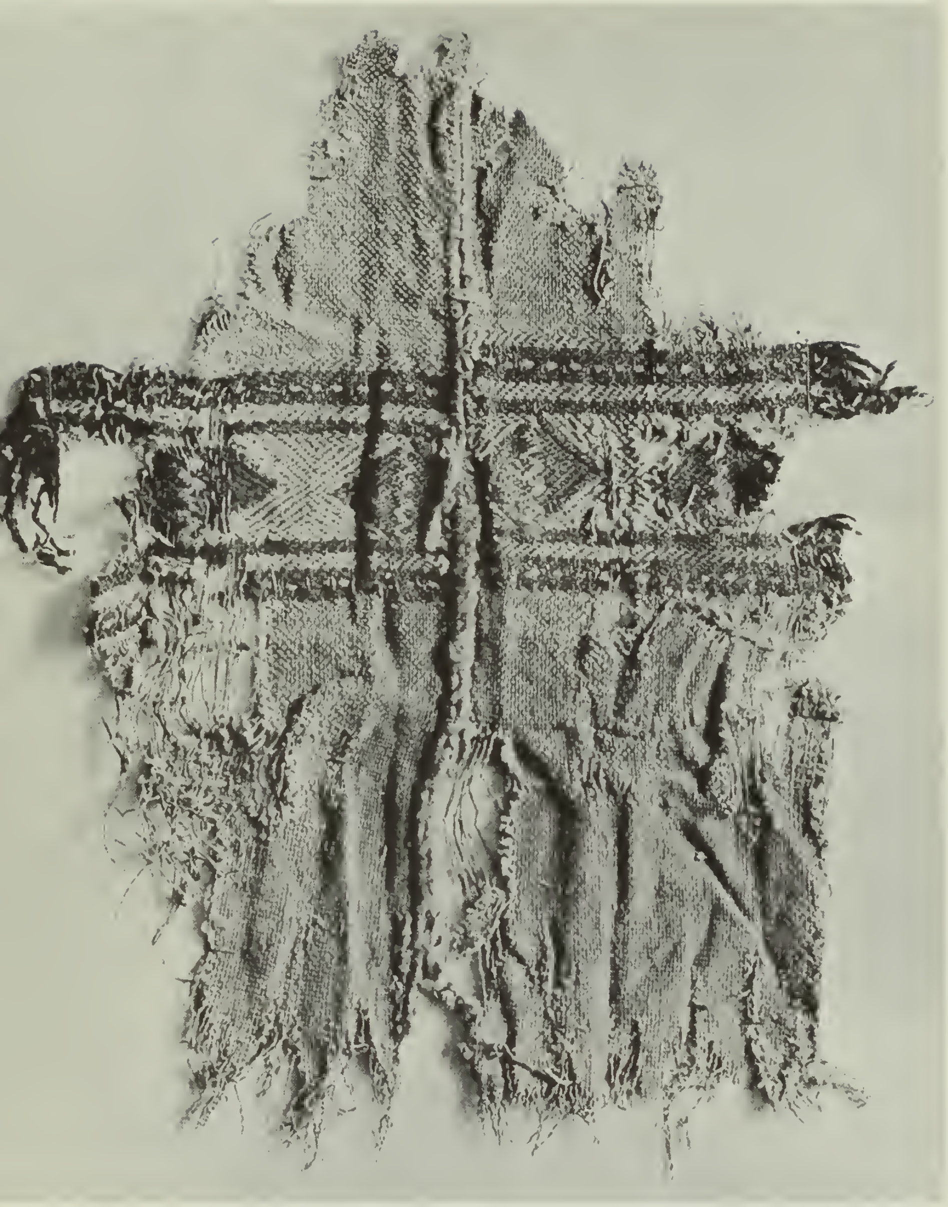
148 Fragment of plain-weave cotton cloth, with closeup showing details of weave.





149 Well-preserved piece of cotton cloth, with closeup showing details of weave.





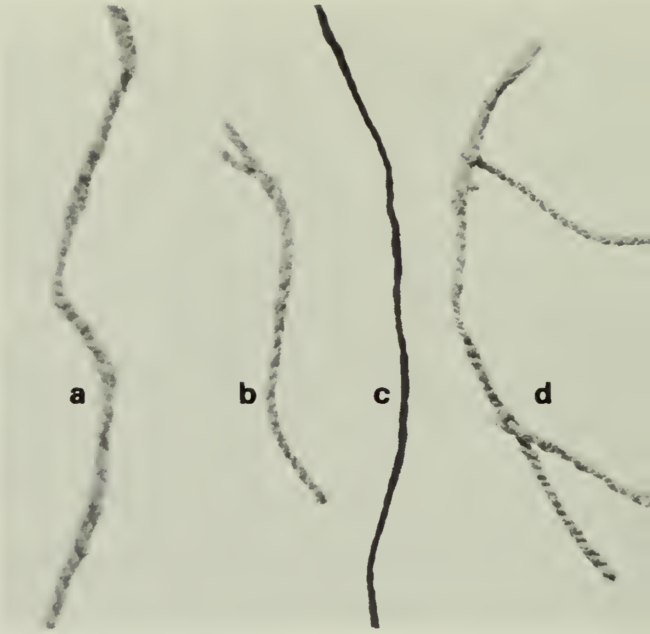
150 Fragment of decorated cotton cloth recovered from Mug House by Nordenskiöld in 1891. (Reproduced from Nordenskiöld, 1893, pl. L.)

it in place (fig. 151d). This must be a part of some object, but just what it was is beyond our present knowledge. One small tuft of unseparated and unspun cotton fibers was found in Room 17.

HUMAN HAIR CORDAGE

Eight lengths of twine, all manufactured from human hair of Mongoloid origin (identified by the Federal Bureau of Investigation), were found in refuse beneath the floor of Room 33. They range in length from 9 to 24 cm. There are four 3-ply S-twist lengths, two 2-ply S-twist and two 2-ply Z-twist pieces (fig. 152). One of the last was fastened to a 3-ply length with an overhand knot. The two Z-twist specimens were twisted loosely; all others were hard. Diameters are between slightly less than 0.1 cm. and 0.15 cm.

Possible uses for human hair twine are difficult to determine. The 1935 Mug House stabilization crew collected several fragments of a fabric made by knotless netting, but without any discernible shape (fig. 153). A



151 Lengths of cotton yarn.

152 Lengths of twine made from human hair. Divider points are 1 inch apart.

153 Fragments of human-hair fabric made by knotless netting. Divider points are 1 inch apart.

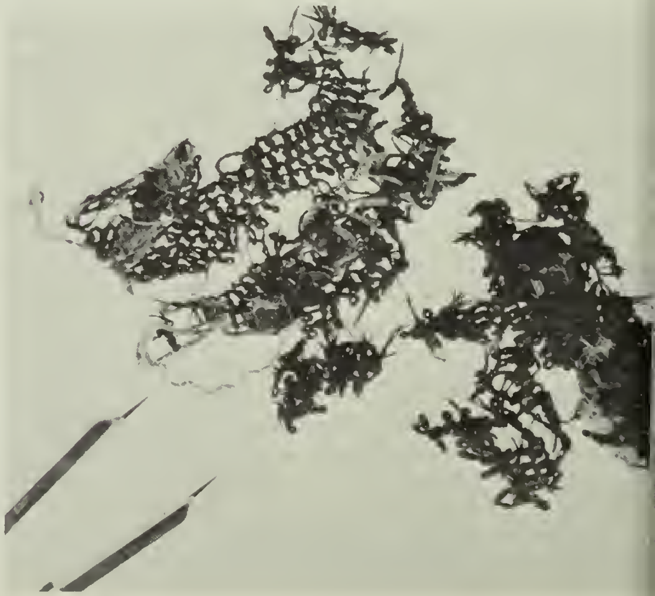


TABLE 17.—COTTON TEXTILES

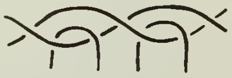
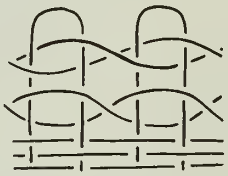
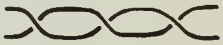
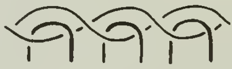
Specimen (Provenience)	Fragment size, cm. Warp x weft	Warp		Weft		Weave	Selvages and description	
		Ply-twist Degree Diam., cm.	Yarns, cm.	Ply-twist Degree Diam., cm.	Yarns, cm.			
18275/703 Rm. 29, fill.)	1.0 x 43.0	1-Z Hard. 0.1.	Ca. 6	1-Z Loose. <0.2.	?	1/1	One loomstring end—two 3-ply S-twist yarns (<0.2 cm. diam.) rolled through warp ends making Z-twist. Probably one side selvage.	
18570/703 Rms. 55–56.)	5.2 x 8.0	1-Z Hard. <0.1.	9	1-Z Loose. 0.1.	12	1/1 Apparent weft face.	One loomstring end—two rows of twining up to left with 3-ply S-twist yarns (0.15 cm. diam.) one at warp loops and one below. One side selvage—plain, but covered with blanket stitch.	
18574/703 (Rms. 55–56.)	13.0 x 6.5	1-Z Hard. 0.1.	8	1-Z Loose, fuzzy.	12	1/1 Square count.	No selvages. One side hemmed with raw edge turned under 0.5 cm. and stitched with 2-ply S-twist yarn (0.2 cm. diam.) every 0.5 cm.	
18822/703 (Area VI, Level I.)	7.0 x 6.5	1-Z Hard. <0.1.	8	1-Z Loose, fuzzy. 0.1.	7	1/1 Square count.	No selvages.	
18851/703 (Area VI, Level IV.)	1.6 x 2.5	1-Z Hard. <0.1.	10	1-Z Loose, fuzzy.	10	1/1	No selvages.	
18915/703 (Kiva B, tunnel.)	20.0 x 20.0+	1-Z Hard, even. 0.5	8	1-Z Loose, fuzzy. 0.1+.	10	1/1	No selvages.	
19036/703 (Old backdirt over Kiva D.)	75.0 x 6.5	1-Z Hard, even. 0.5	12	1-Z Loose to very loose, fuzzy. 0.1.	9	1/1	One loomstring end—one row of twining at warp loops almost completely covered with overcasting and blanket stitches using 2-ply S-twist. Cotton yarn (ca. 0.1 cm. diam.) one side selvage-two auxiliary heavy 3-ply S-twist yarns twist in and out through weft loops so that weft ends are concealed (see 24457/703, below). Three rows of double running stitching parallel warps near side selvage. Raw side is evenly cut or torn.	
24457/703 (Rm. 44, fill.)	19.0 x 8.0	1-Z Hard. 0.5	11	1-Z Barely twisted. 0.1.	10	1/1	One side selvage—two auxiliary heavy 3-ply S-twist yarns twist in and out through weft loops so that weft ends are concealed. Uncompacted wefts.	
26173/703 (Backdirt from Rms. 45 and 46.)	6.3 x 5.9	1-Z Hard and med. hard. <0.1.		1-Z Loose and very loose. 0.1+.	9+	1/1 Square count.	No selvages. Two red stains on one surface.	

TABLE 17.—COTTON TEXTILES—Continued.

Specimen (Provenience)	Fragment size, mm. Warp x weft	Warp		Weft		Weave	Selvages and description
		Ply-twist Degree Diam., cm.	Yarns, cm.	Ply-twist Degree Diam., cm.	Yarns, cm.		
4834.190...... (National Museum of Finland.)	30.0 x 31.0....	1-Z........ Hard. <0.1	10.......	1-Z............ Loose,fuzzy. 0.1+. (White.) 1-Z. Very loose, 0.15 (brown—10 YR. 2/3—Munsell.)	10	1/1........ Square count and 2/1 twill weft face.	Two side selvages—rolled and whipped with cotton yarn, then whipped together with heavy soft cotton yarn to for a tube. Main body is 1/1 square count weave. Decorated bands are 2/1 twill with pitch up to the right in narr brown and white bands, diamond twill in wide band with adjacent brown and wh wefts turning on a common warp. White stitches in narr brown bands and brown diamonds are embroidery. Zigzags follow twill lines almost perfectly and overlie brown wefts. No end selvages total length unknown.

single 2-ply S-twist element, 0.15 cm. in diameter with a fairly hard twist, was looped back through itself, producing a fine even network with a mesh about 0.3 cm. in diameter. The evenness in mesh implies use of stick gauges. The fragments show signs of extensive repair with fine 2-ply Z-twist yucca twine and narrow strips of split yucca leaf. The old Wetherill collections from Mesa Verde contain leggings made from similar fabrics, so perhaps these fragments once belonged to such an object.

154 Fragment of skin with beginnings of strip (lower left), a short strip of fur (center), and a length of twine wrapped with strips of fur (upper right).

Human hairs were found throughout the ruin, in refuse and in lumps of construction adobe. Probably these loose hairs were naturally shed and would not have been intended for use in cordage.

ANIMAL SKINS AND SINEW

We can tell little about the role of dressed animal skins and sinew in Mug House material culture, although we recovered many fragments from our excavations. Most of them (21) were irregular strips and pieces lacking signs of sewing. Four small pieces bore red ocher stains on one surface and may once have served as wrappings for paint pigments. One of these was part of a rock squirrel skin. There was another piece of squirrel skin from which someone had begun to cut narrow strips, possibly to wrap around cordage for a fur blanket, and one long narrow strip already cut from the skin of squirrel (fig. 154). A second strip of unidentified fur retains the spiral twist acquired during wrapping.

Eight fragments showed evidence of sewing, although none were large enough to reveal their original purpose. Yucca and cotton twine, sinew, and even a leather thong were employed in the stitching (figs. 155 and 156b–c).

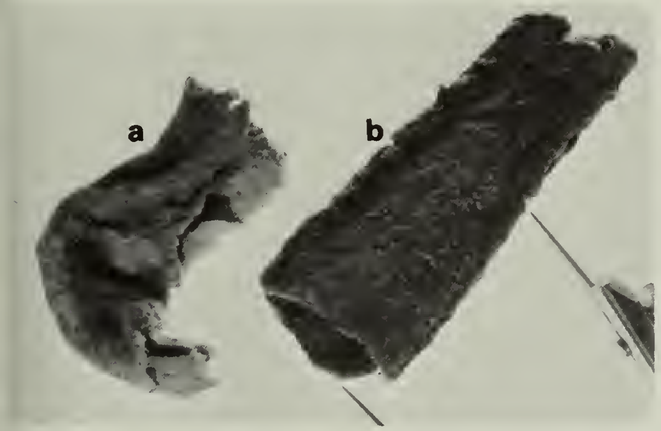
Many fragments of skin had been denuded of hair, and several appeared to have been subjected to rudimentary curing. Six pieces could be identified as deer or probably deer hide. Most likely the other thick fragments were also deer.

Thongs. Five strips of leather from 0.4 to 0.7 cm. wide appear to have been cut for thongs (fig. 156a). Present lengths range from 8 to 34 cm. (3 to 13½ inches). Only one thong could be identified as deer hide.

Sinew. Besides its use in stitching on three pieces of hide, three free lengths of sinew and one bundle were found. One of the free lengths belonged to a turkey, but the others could not be positively identified. The bundle contained sinew strips—possibly turkey tendons—between 13 and 14 cm. long, held together by four wraps of 3-ply S-twist cotton twine and secured by a square knot (fig. 157). One end of the bundle was partly chewed by rodents.

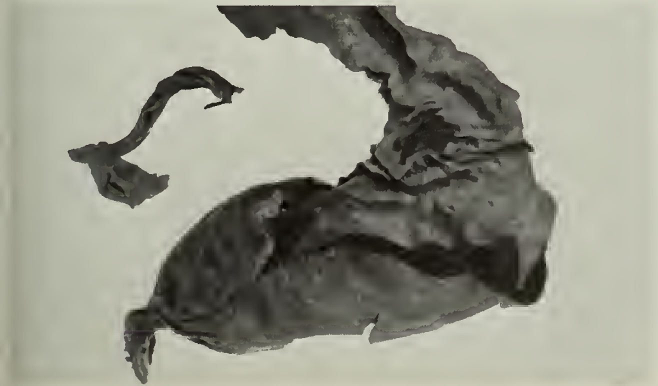
Pouches or Bags. Two items were found sufficiently intact to indicate their use as pouches or bags. The smaller, from Room 44, consists merely of a small piece of skin, measuring about 3 by 4.5 cm., that had been gathered at the edges and tied (fig. 158a). A slight red stain on the inside suggests that it could have held paint pigments.

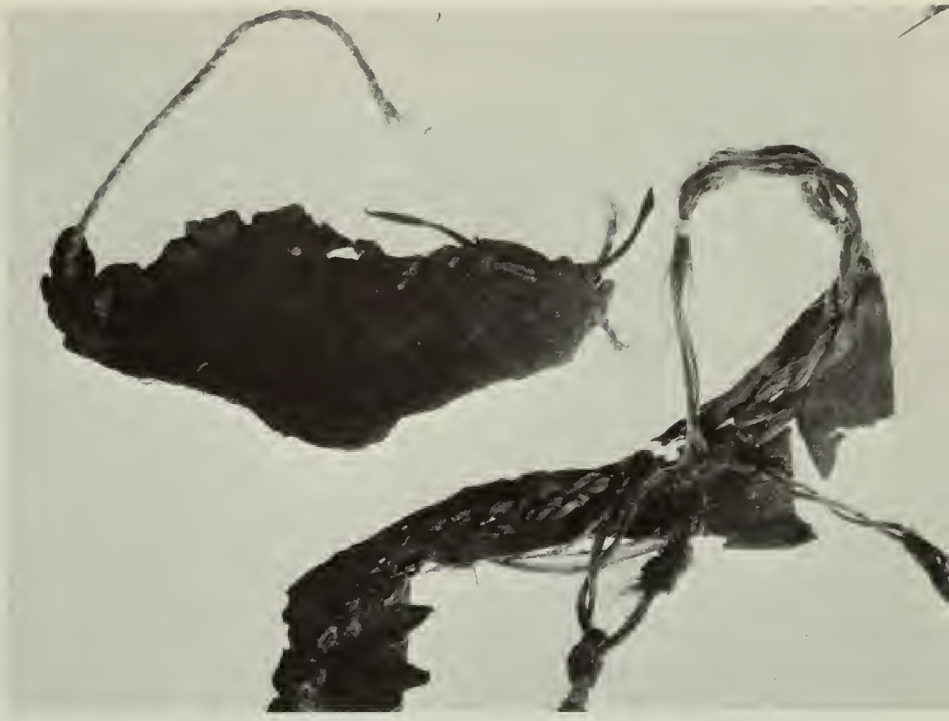
The larger pouch or bag, from refuse in Area V, was sewn into a tube with one end gathered and tightly wrapped with 2-ply Z-twist yucca twine four times around (fig. 159). Although only a few fibers of this twine remain, the thin soft skin of the pouch retains clear impressions of the twine. The tube was formed by sewing two edges together with fine untwisted yucca fibers, four stitches per centimeter. Several rips, including one less than a centimeter long, were mended in this same manner, suggesting the pouch held some fine granular substance. A long flap with many folds may have covered the open end. A detached strip of the same kind of skin is square knotted to a piece of yucca cord. With the flap folded, the pouch is 24 cm. long and 8.5 cm. wide.



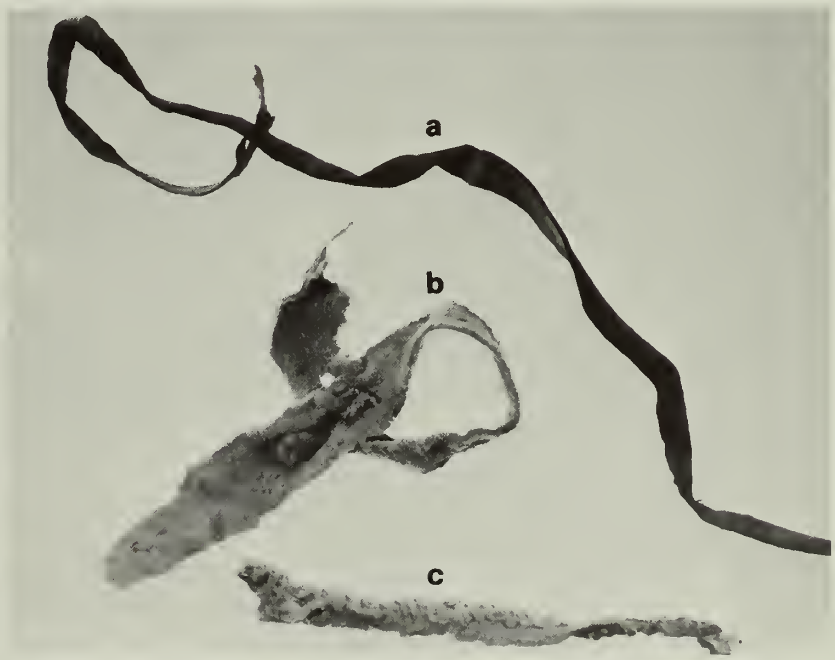
158 Skin objects. a, Pouch or bag; and b, point guard or sheath. Divider points are 1 inch apart.

159 Skin pouch or bag.



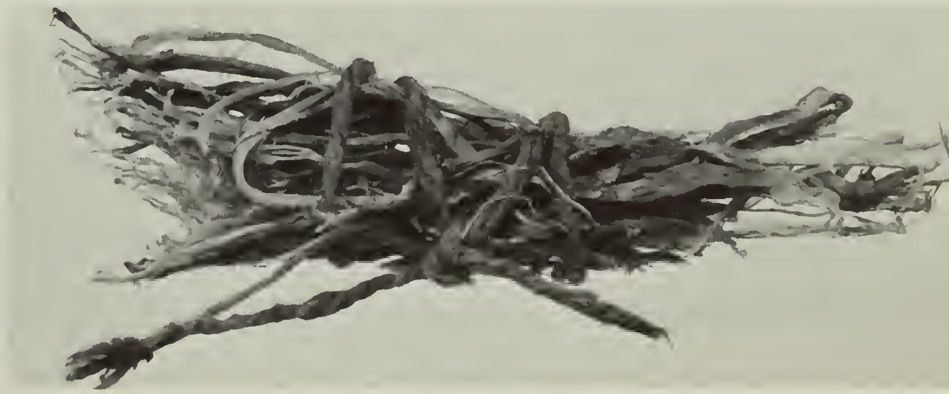


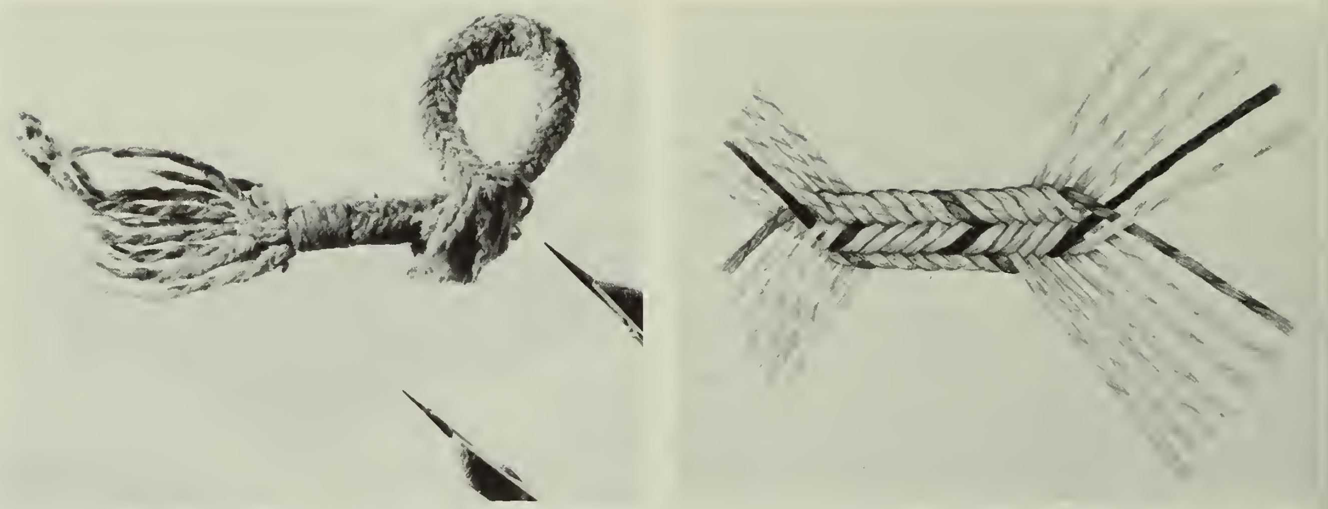
155 Evidences of sewing on animal-skin fragments. Divider points are 1 inch apart.



156 Fragments of animal hide. a, Thong or strip; b, sewed fragment; and c, whipped edge on piece of hide.

157 Bundle of sinew tied with yucca twine.





160 One of four lengths of cotton, 13-strand sennit braid associated with skin pouch or bag illustrated in fig. 159 (a), and drawing showing construction of braid (b). Divider points in (a) are 1 inch apart.

Associated with this pouch were four lengths of a 13-strand sennit braid (Graumont and Hensel, 1946, p. 232, fig. 66 and pl. 115), totaling 45 cm. (17¾ inches) in length. Each element is a 2-ply S-twist soft cotton yarn, just over a millimeter in diameter. From one side the strands pass under-6 and over-1, while from the opposite side they go under-5 and over-1 (fig. 160). One end is served with a tight wrapping of the same yarn with its ends tucked under. Apparently this braid belongs with the skin pouch, although its specific function is obscure.

A small piece of skin with sewing along one edge and red ocher stains on one surface may have been another small bag.

Point Guard or Sheath. A small tapering tube had been formed by sewing together two small pieces of skin (fig. 158b). Two-ply S-twist yucca thread stitching runs along both sides of the finished product, which measures 4.5 cm. long and 1.4 cm. across the wide, open end. This tiny sheath would make a fine protector for the delicate point of a drill, awl, or arrow point.

ORNAMENTS

The popular conception of primitive man envisions him as gaudily bedecked with jewelry and other objects in a multitude of colors. We did find evidence that the Muguenos had adorned themselves, but hardly in a manner supporting this general view. We found some of the more durable things such as ornaments (fig. 161) and paints, but no perishable items that could be identified as articles of adornment. Ornaments were probably among the precious objects taken by the people when they left. The lack of ornaments in burials suggests they were considered luxury goods.

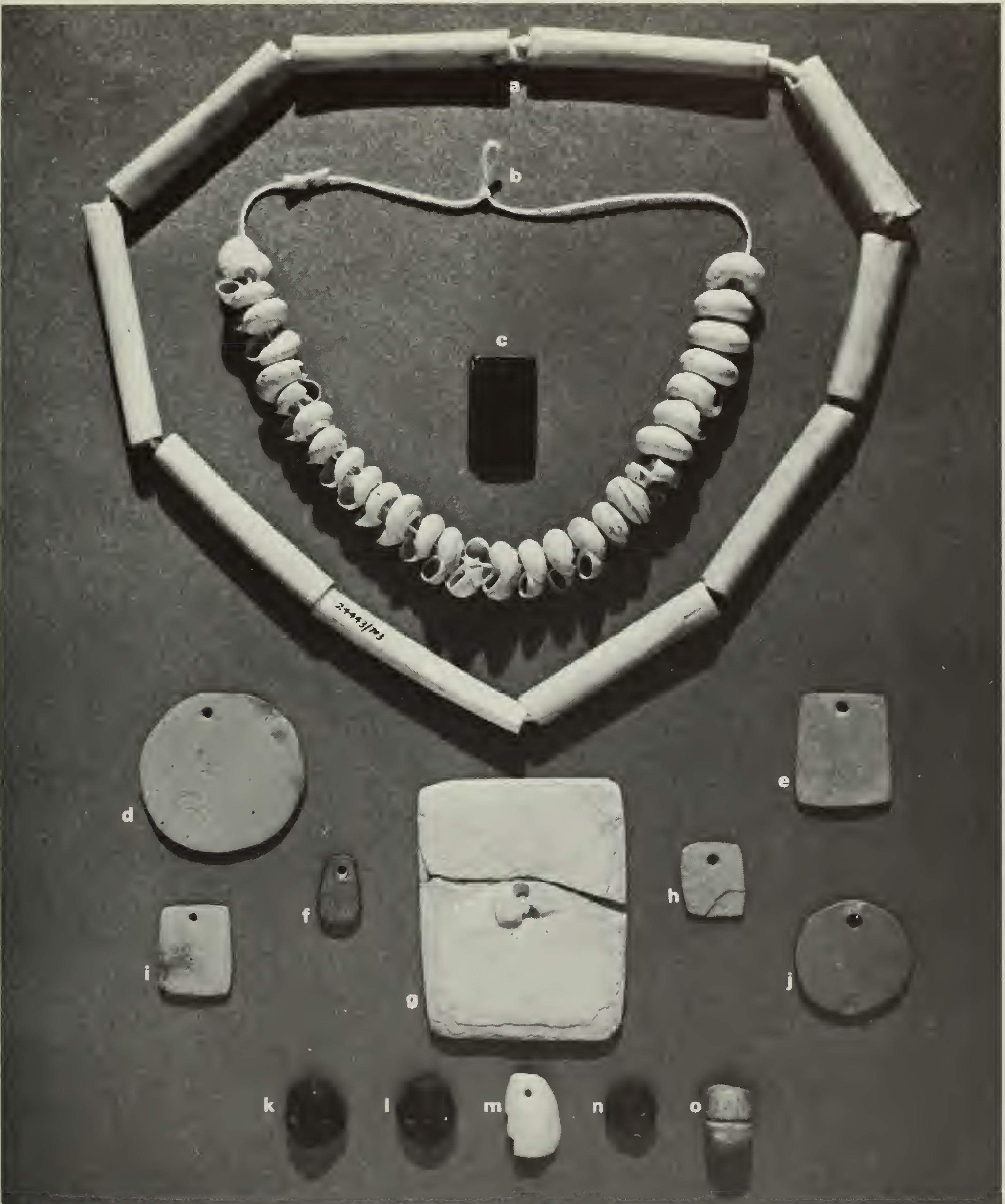
Stone Pendants. The seven complete pendants fall into two form classes: five are rectangular or trapezoidal with the biconically drilled hole in the middle of one short end, and two are circular with a hole drilled near the perimeter. Two of the rectangular ones were made of a black jet or lignite (fig. 161 c, f), the others were shaped from a red, probably burned, shale (fig. 161 d, e, h–j). All but one came from the trash slope, or from the rubble fill of kivas; the larger, rectangular jet pendant was found on the floor of Room 78. None were found with burials. Presumably they were worn around the neck, although it is possible that some of the smaller ones might have been earrings.

Unfinished Stone Pendants. Objects of red shale (9), jet (2), and travertine (2) appeared to be designed as pendants but were never finished. Several were ground to appropriate size and shape and lacked only the perforation. Drilling had actually been started in four of them. It is possible some were discarded because they broke during manufacture, but the majority show no signs of such breakage. Most seem to have been intended as rectangular or trapezodial pendants; only two, both of red shale, are circular.

None of these objects came from the trash slope, but several were found in refuse deposits within rooms. Most were mixed with the rubble fill of various rooms and kivas. Four, however, were found in place on kiva or room floors: one long, rectangular shale specimen in Kiva E; a smaller, rectangular piece of shale in storage Room 58; a subtriangular jet piece in Room 62; and the fragment of a very small, rectangular shale piece in the ash fill of the hearth in Room 24/1.

Shell Pendant. Only one object in the Mug House collection was manufactured from shell of marine origin. This is a pendant (fig. 161m), fashioned from the greater part of a *Conus* shell, probably of the species *princeps*, from the Gulf of California (identification by Robert J. Drake). The item was found on the trash slope near the south end of the ruin. Since the pendant was still whole, it is hard to imagine that its owner willfully discarded such a rare object. It is possible that this ornament was originally placed in a grave that was subsequently disrupted, making its association unrecognizable.

Stone Buttons. Objects in which two holes have been drilled from one surface so as to converge before penetrating the other surface are referred to here as buttons. Three of those we found are small enough—1.5 cm. in diameter—to have passed through buttonholes and acted as garment fasteners (fig. 161 k, l, n). They are all made of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161 Various ornaments: bird bone and snail shell beads; pendants of black jet or lignite, shale, and conus shell; buttons of black jet or lignite and shalelike material; and a toggle of green malachite(?).

black jet or lignite and are nearly circular. Two with lenticular cross sections were found together in the rubble fill of Room 44, and the third had a planoconvex section and came from storage Room 58.

Three much larger, rectangular buttons must have satisfied purely decorative desires and were probably fastened to the surfaces of garments with no functional intent. A corner fragment of one made of jet was also found in the fill of Room 44; about half of another, made of travertine, measuring perhaps as much as 4 cm. long and 2.5 cm. wide, came from the rubble fill of Kiva B. The largest and only complete specimen, made from a light gray shalelike material, with dimensions of 7.2 by 5.7 cm., was found in two pieces among the fallen roof material of Kiva D (fig. 161g, upper).

Stone Toggle. This object resembles a miniature, full-grooved hammerhead with a total length of only 1.5 cm. (fig. 161o, lower). It is made of light green malachite (?) and could have served as a garment fastener, by passing through a buttonhole or a loop. It, too, was found in storage Room 58.

Tubular Bone Beads. These items are usually called bone tubes in archeological reports, but I feel we can safely call them beads. There are several complete necklaces of bone tubes on the original strings in the old Wetherill collections at the Colorado State Museum. In fact, they help justify my restringing 10 of these beads, found together in Room 44, as a complete necklace (fig. 161a). These are the only bone beads *not* made from elements of the turkey. Seven were made from ulnae of the golden eagle and three from the same elements of the Canada goose. Eight are left ulnae and two are right ulnae. Thus at least eight birds, six eagles, and two geese were required for this one necklace. Three other beads made from the ulna and tibiotarsus of turkey were found among the scattered bones eroding out of Burial M12 in the center of the trash slope. These very likely formed a part of a necklace that had been buried with this man.

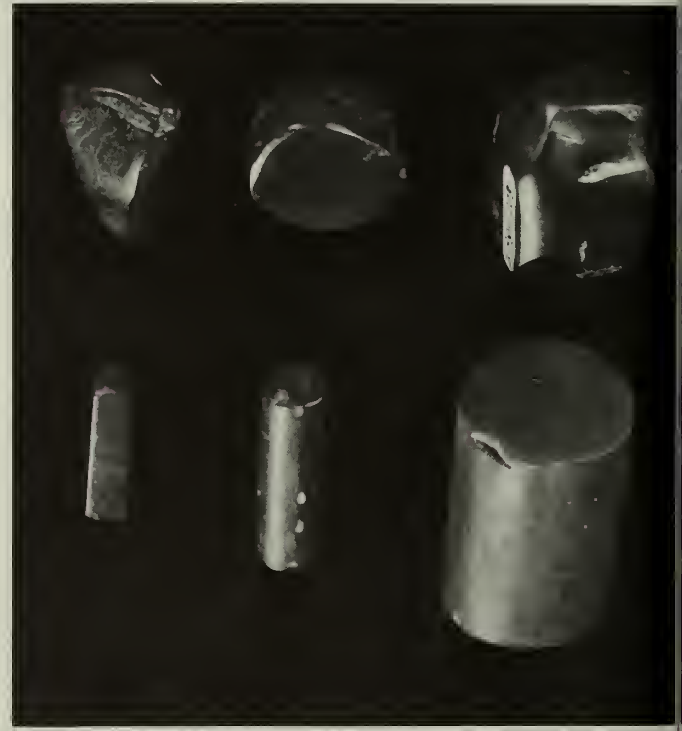
Seventeen other tubular bone beads were recovered. For the most part, they were scattered throughout the rubbish and rubble, both in rooms and on the trash slope. One came from the floor of Room 24. Only one bead of this group was found in a grave, placed at the back of the head of Burial M27, where it had probably served as a hair ornament. This is one of only four specimens made from the turkey radius, a bone with a relatively small diameter compared to the bones from which the rest of the beads were made.

Bone beads could be made easily by cutting off the two articular joints of a long bone and grinding down the ends to make them smooth. Occasionally, several beads were made from one bone. Only one specimen in our collection has a hole drilled in the body near one end. All of the bone beads clearly belong to the latest occupation of Mug House.

Snail Shell Beads. The previously disturbed fill of Room 40 produced 37 shell beads, probably part of the same string as the 104 beads found by Nordenskiöld (1893, pl. 51). Like Nordenskiöld, I have taken the liberty of restringing them for illustrative purposes (fig. 161b, inner), although they were found loose. These beads were manufactured by grinding off the apex of the shell of the land snail *Oreohelix strigosa depressa* (identification by Robert J. Drake). The complete necklace must have presented a rather imposing sight around the neck of its wearer. Although several other land snail shells were found in other locations at Mug House, none had been definitely worked into beads.

PAINT

Paint Stones. Like many other aboriginal American groups, the Pueblo Indians knew many sources of paint pigments with which they could decorate themselves, their homes, and objects destined for ceremonial and domestic use. Several of the mineral pigments recovered from Mug House occur naturally as lumps or pebbles. Rubbing them against a sandstone slab produced a powder that could then be mixed with the necessary vehicle or carrier. Rubbed surfaces or facets characterized all of the 39 paint stones (fig. 162). They represent various kinds of hematite, ranging from soft, pinkish lumps through red and red-brown stones, to hard nodules with a metallic appearance. There were also seven lumps of yellow to tan limonite and one lump of black shale.



162 Paint stones of hematite.

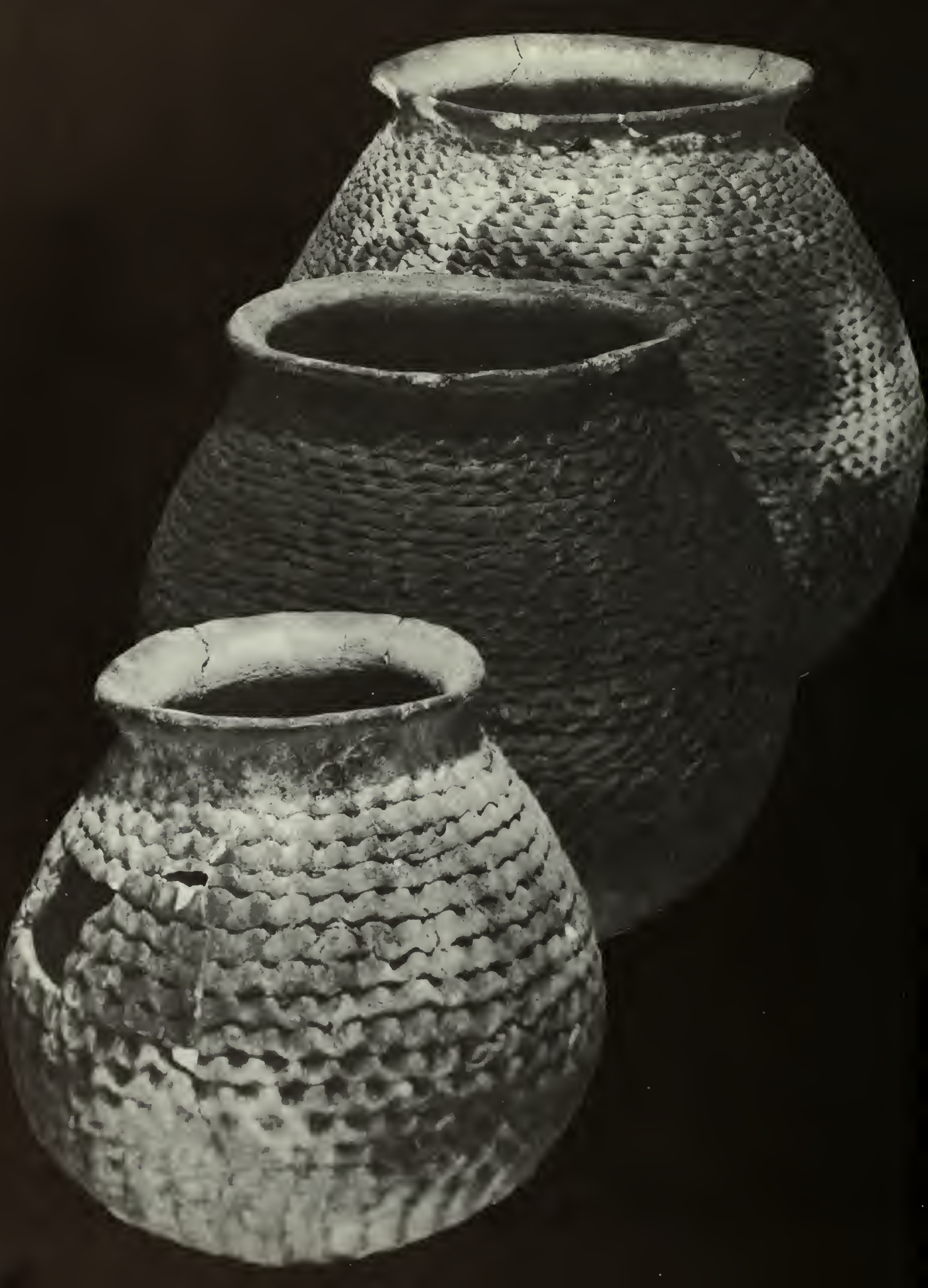
Twenty-two lumps of hematite were fashioned into cylindrical (13) or rectangular (9) sticks with rubbed surfaces at both ends. These forms seem to have no apparent significance; both shaped and unshaped lumps were normally found together.

Three lumps of limonite were found in the trash. Apparently all the other paint stones were considered usable. They were found on the floors, banquettes, and niches of kivas; on the floors of rooms; and, in one case, in the second story of the north tower, Room 60. Two cylindrical sticks and two lumps, all of hematite, were found in the probable "medicine kit" of Burial M6.

Except for the fired pottery, the preservation of painted objects is very poor. We do have remnants of painted plaster and faint traces of color on some stone and other artifacts. However, these tell us little about the use of paint at Mug House.

The sandstone slabs on which paint pigments were worked are discussed as "paint-stained slabs" in chapter 10. In addition, there are three paint pestles, a small leather "paint sack," and a shallow cuplike concretion in which paint may have been mixed.

Laboratory of the Wetherill Mesa Project, taken in 1963.



CHAPTER 8

Utensils

The term "household equipment" might well include utensils and tools. But, since the items that can be grouped under these two headings made up the vast majority of objects recovered, this chapter will treat utensils, and the following one will discuss tools.

A utensil usually denotes an instrument or vessel that is used in food preparation. For purposes of this report, I have restricted the use of the term to containers and to the covers and rests for them. Thus the following are covered in this chapter: pottery vessels, potsherds, baskets, pot rests, and pot covers.

POTTERY VESSELS

Wetherill Mesa Project workmen unearthed 439 whole and restorable vessels in Mug House during 1960–61. In addition to these, the Mesa Verde Museum has three whole pots found there in 1928 and 1935, and the Colorado State Museum in Denver has four vessels in the Wilmarth collection taken from Mesa Verde in 1892. Three pots were found with burials in Adobe Cave, two excavated in 1935 and one in 1961. Thus it has been possible to study a total of 449 complete vessels. Nordenskiöld (1893) refers to six pots he obtained from Mug House, and Wetherill's first list (see p. 1) mentions at least 21 more. In all, we have records of at least 476 whole and restorable pottery vessels from Mug House, and the numerous potsherds found represent many more.

The great majority of these vessels fall into two main categories that clearly represent the kinds of pottery made and used by the Component C occupants of Mug House. These are (1) the corrugated jars and (2) the carbon painted black-on-white vessels that would be classified as McElmo and Mesa Verde Black-on-whites (Abel, 1955, Ware 10B—Types 1 and 2). Each group is quite homogeneous and will be treated as a unit even though the designation of the second category requires the hyphenated McElmo-Mesa Verde name. The few remaining vessels are treated according to established pottery types (Abel, ibid.).

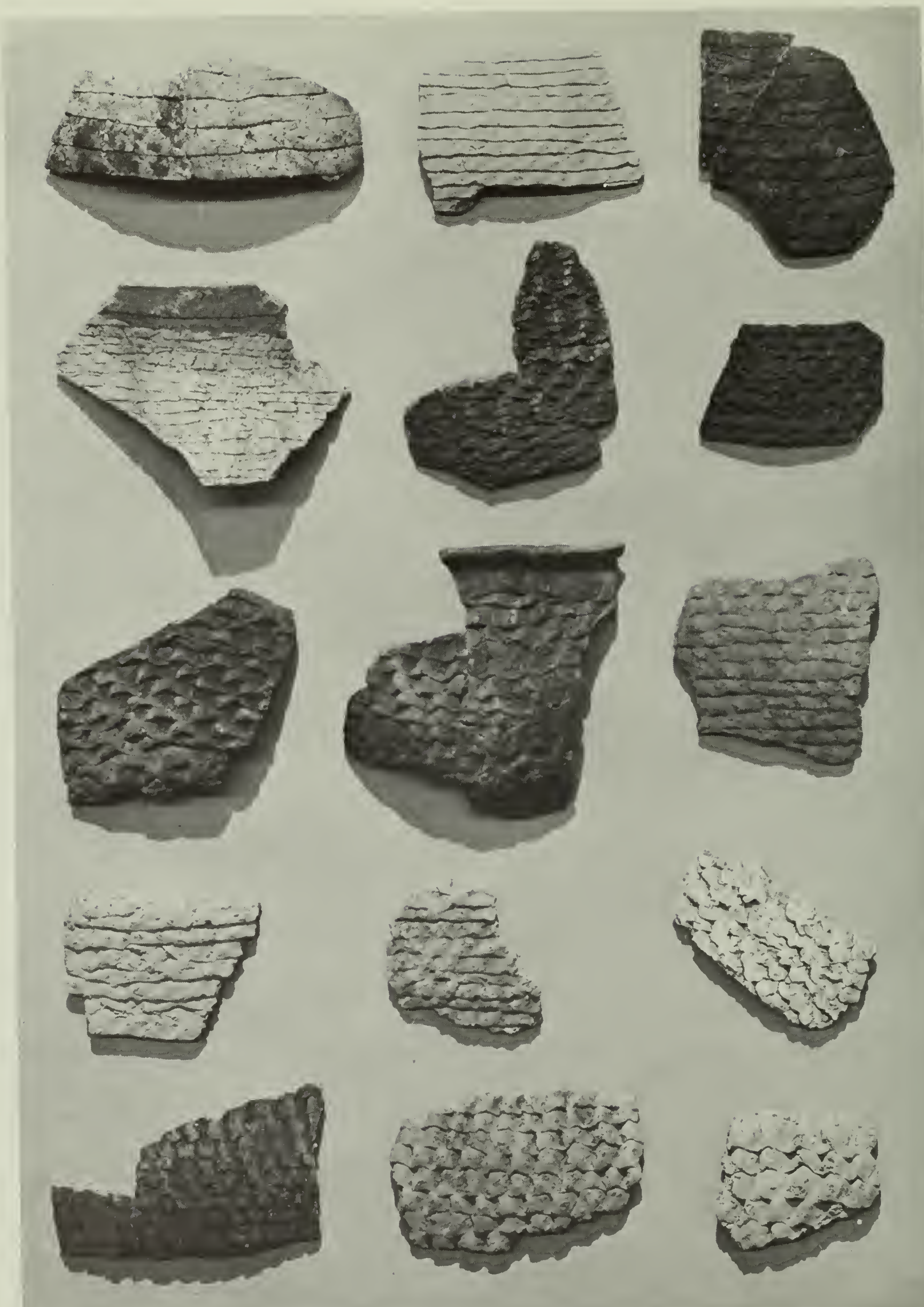
Corrugated Jars

All 129 corrugated jars from our excavations may be classified according to shape as Mesa Verde Corrugated. (Two corrugated jars were left in place in the ruin and are not included in the following description.) They were constructed by spirally coiling thin ropes of clay from the center of the jar bottom to the mouth. Each successive coil was bonded to its predecessor only on the inside of the jar, so that the separate coils remained clearly visible on the exterior. In addition, the potter crimped each coil in the process of attaching it, producing indentations on the exterior surfaces. In many cases, impressions of fingernails and skin have been preserved by the firing.

Although we did not attempt to isolate any specific clay sources, we can say that many of the shale lenses in the Mesaverde group produce a fine clay like that found in these vessels. All of the vessels fired to some shade of gray, and 62 retained a dark carbon streak in the core. The clay body was tempered with relatively coarse particles of crushed, dark-colored igneous rocks, along with plentiful amounts of quartz and sandstone.

The interior surface of each jar was scraped to obliterate the coils, and occasionally one was smoothed to obliterate the scraping marks also. In most of the jars, though, scraping marks are prominent. Indented coils entirely covered the exteriors of all but two vessels. On the bottom halves of these two (fig. 166a–b), the coils had been obliterated and smoothed over, while the upper halves were typically corrugated.

The range in coil width and depth of indentation may be seen on representative sherds shown in figure 163. Perhaps several of the extremes of smoothness, squareness, or relief could be distinguished as separate subtypes or varieties. In the Mug House collections, however, all of these extremes were linked with one another by series of sherds showing gradations from one to another. None of these potential subgroups tended to be limited to certain proveniences that might indicate temporal signifi-



163 Variations in corrugation on Mesa Verde Corrugated sherds.

cance, different patterns of usage, or even the personal preferences of certain potters.

Some of the sherds with squarish indentations and conspicuous temper protruding through both surfaces look like Hovenweep Corrugated (Abel, 1955, Ware 10A—Type 8). Squarish indentations appear on vessels and sherds alike, both with the coarse protruding temper and with the inconspicuous temper typical of Mesa Verde Corrugated. The coarse protruding temper may also be seen in specimens bearing the undulating indentations common on Mesa Verde Corrugated. A third attribute of Hovenweep Corrugated, a partial blurring of the indentations as if done by wet hands after construction but before drying, also occurs independently and in all possible combinations with squarish indentations and coarse protruding temper. Although some sherds from Mug House could probably be classified as Hovenweep Corrugated, nonetheless the common occurrence of these three attributes by themselves and in combination with one another effectively masks the lines of distinction between these two corrugated pottery types.

Coil width of all corrugated jars ranged from 3 to 11 coils per inch. The mean is five coils (41.7 percent), with the next most numerous group at six coils per inch (24.4 percent). Ninety-four percent of all pots fall within the range from four to seven coils per inch, which may be considered typical of this group. Vessel size is not related to coil width. Jars with corrugated rims are more restricted in coil width than others: 16 out of 17 have either four or five coils per inch.

The indentations on one jar have been carefully alined so that the peaks and troughs form diagonal ridges and troughs (fig. 164b). This characteristic is seen frequently on corrugated jars of earlier times and is usually indicative of Pueblo II. However, this vessel comes from a definitely Pueblo III context, exhibits a typical Pueblo III shape, and has corrugation on its rim, characteristic of Pueblo III.

Shape. Vessel shapes range between that of a crude spheroid and that of an egg. The greatest diameter is below the midpoint of the vessel, and the diameter of the mouth usually equals about one-half to two-thirds the maximum diameter. There are many variations on this basic shape which can best be seen by referring to the illustrated specimens (figs. 164–168). Some tend to have a flat base with a long neck, while others have an almost pointed bottom. The maximum diameter often exceeds the total height, but there are numerous examples of the reverse.

Rims. Rims were formed by the addition of a wider band of clay around the mouth. Only rarely are two fillets added. On every jar, the vessel wall turns sharply outward from the narrowest diameter of the mouth, rising only a short distance further to a rounded lip. In most instances this eversion occurs at the juncture of the rim fillet with the corrugated body, but there are numerous examples where it occurs both above and below this juncture.

A recurrent variation carries the corrugation over the rim's exterior all the way to the lip (figs. 164b and 166g). This rim-corrugation characterizes 17 of the whole vessels and 6.3 percent of the sherds that could be identified as Mesa Verde Corrugated.

Surface Embellishments. Not all of the jars had monotonously corrugated exteriors. The simplest form of embellishment involved variations in the crimping of the coils as they were added. On one vessel, a single, uncrimped coil encircles its greatest diameter (fig. 167a); two others have a set of three unindented coils on the upper part of the body just above the maximum diameter (fig. 164a). A fourth jar (fig. 164d) exhibits parallel bands of alternating indented and unindented coils with some diagonal alteration near the rim. There are also some tool marks visible in the troughs between coils. On still another jar the potter changed the direction of crimping several times from bottom to top.

Patterns could also be developed by obliterating the coils on parts of the exterior. In a sense, two corrugated jars with smooth bottoms illustrate this concept, although they may likewise be regarded as retaining a trait common to earlier corrugated jars. The only clear case of this kind of patterning has two horizontal bands of obliterated coils around the upper half of the body, each about 2 cm. wide.

Markings over the corrugation after the vessel was constructed are extremely rare in this series of pots and sherds. Two jars have grouped impressions of a fingernail and one other, mentioned above, has a few visible tool marks between coils. On sherds, there are a few examples of finger trailing and of punctation with a stick as well as fingernail impressions.

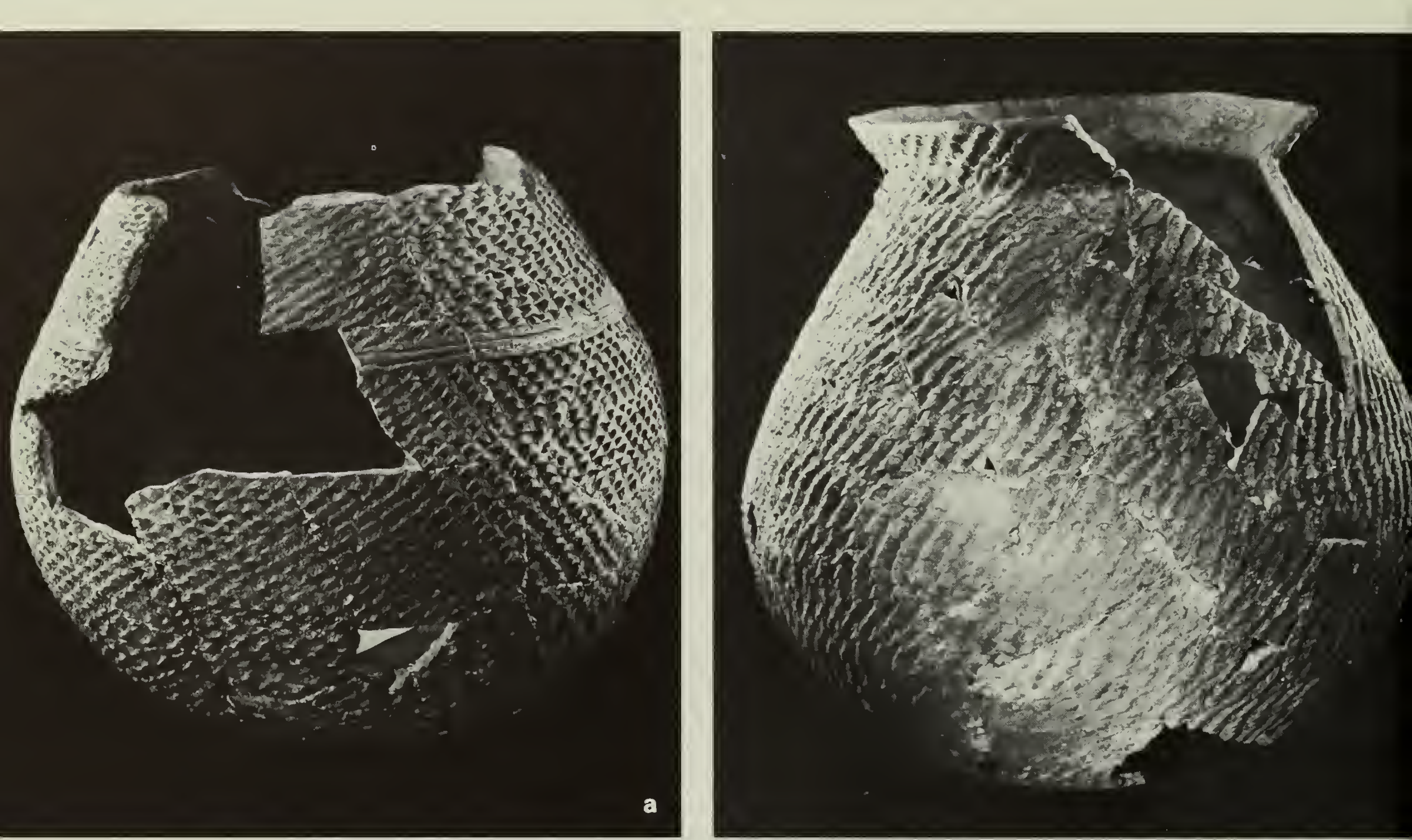
Only 8 corrugated jars may be considered patterned by these several methods. A similar proportion of the Mesa Verde Corrugated sherds (6.6 percent) shows patterning (fig. 169).

Applique is much more common, appearing on 15 vessels. No separate count of sherds with applique was made, because the figures are important only in terms of possible whole vessels represented, and these features are limited to small portions of the vessels. Some of the applique forms are shown in figure 170.

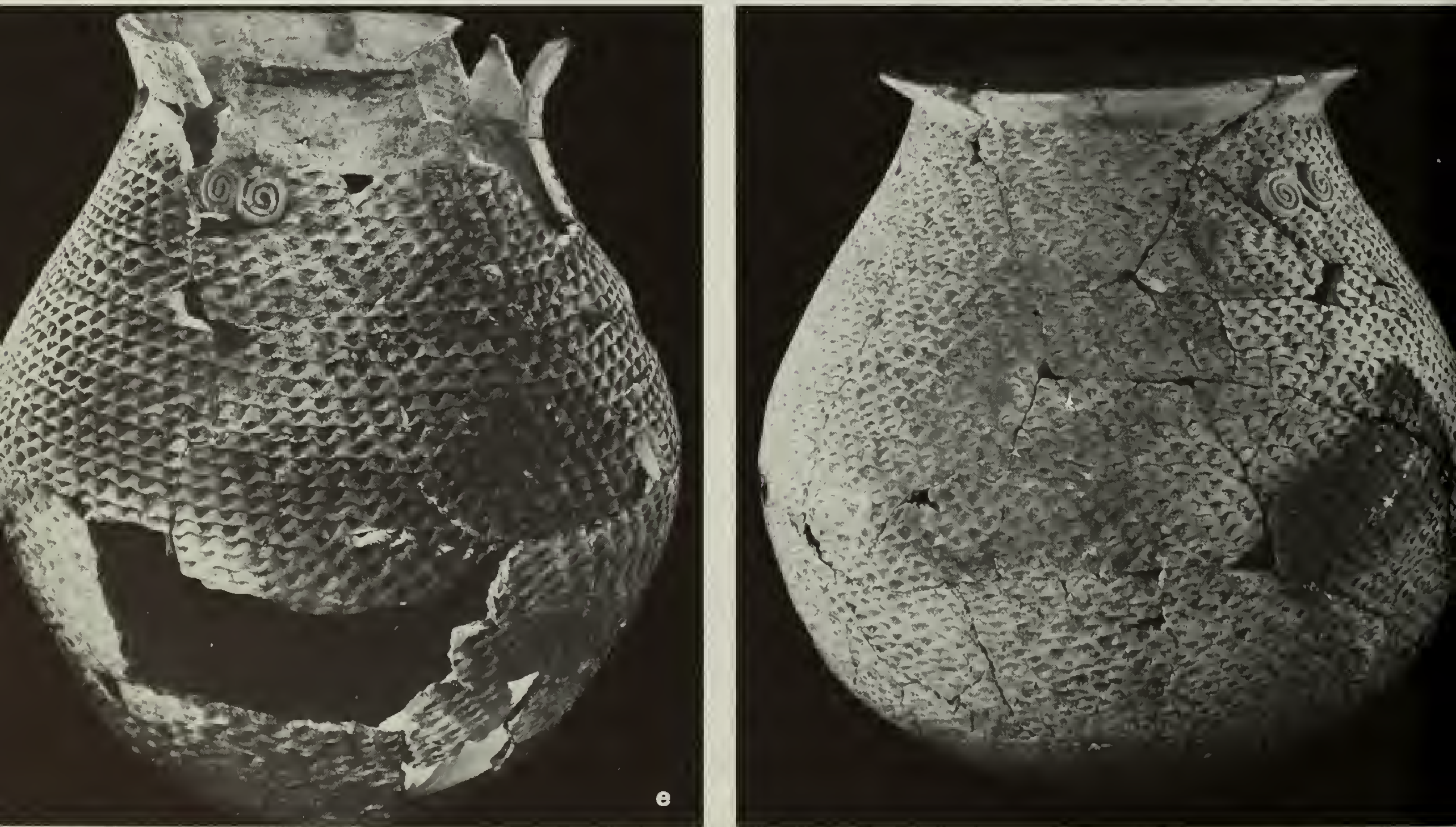
Most common of the applique figures, found on 9 jars, is the double scroll made of a rope of clay about equal in thickness to an average coil (fig. 164 e–g). There are usually two of them, on opposite sides of the jar, just beneath the base of the rim. Next in popularity are small conical lugs, seen on four jars. One is located at the shoulder (fig. 166f), but the others—two pairs and one single lug—lie close to the rim. Two vessels exhibit applique bird tracks in a similar location.

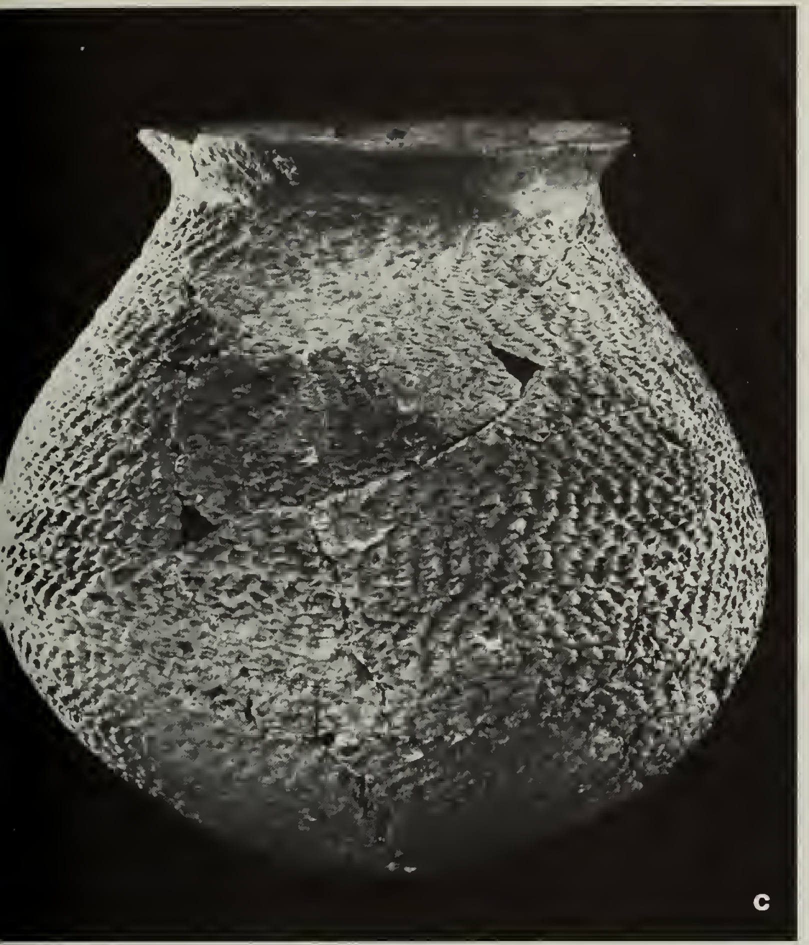
It is not possible to recognize any significant correlations among these several attributes. Patterning and applique appear on jars with corrugated rims in the same proportions as they do on vessels with plain rims. A single jar carried both patterning and an applique bird track.

Painted decoration appears only in the form of splotches or crude lines drawn just inside the rim and usually pendent from the lip. This feature is found on only one



164 *Large and extra-large corrugated jars.*





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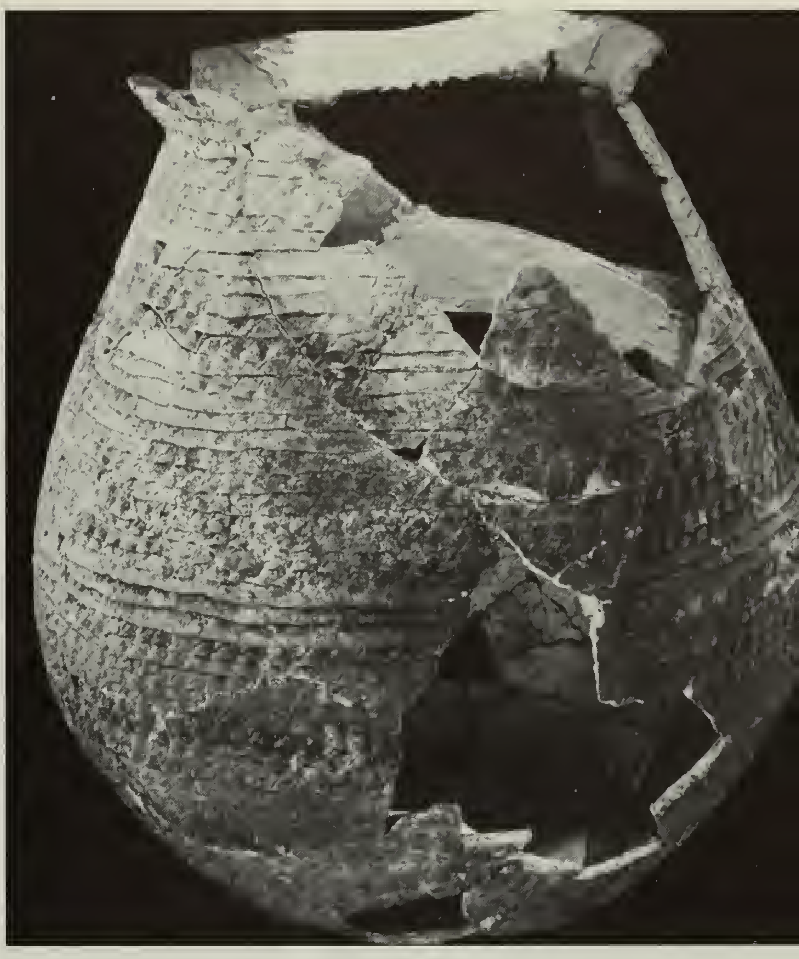

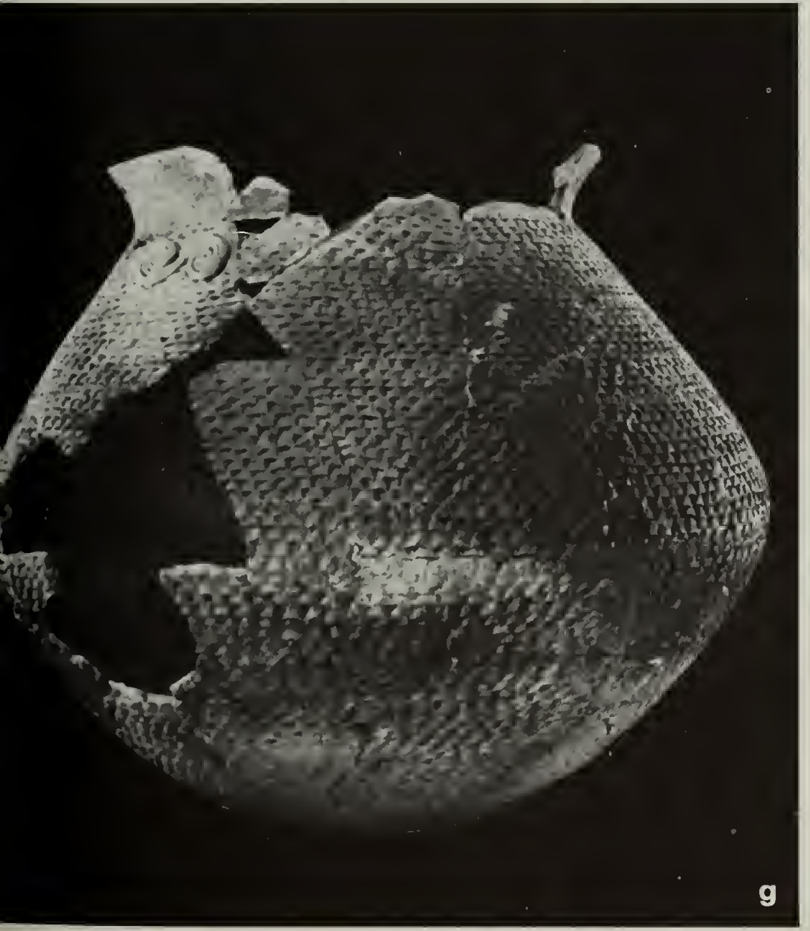

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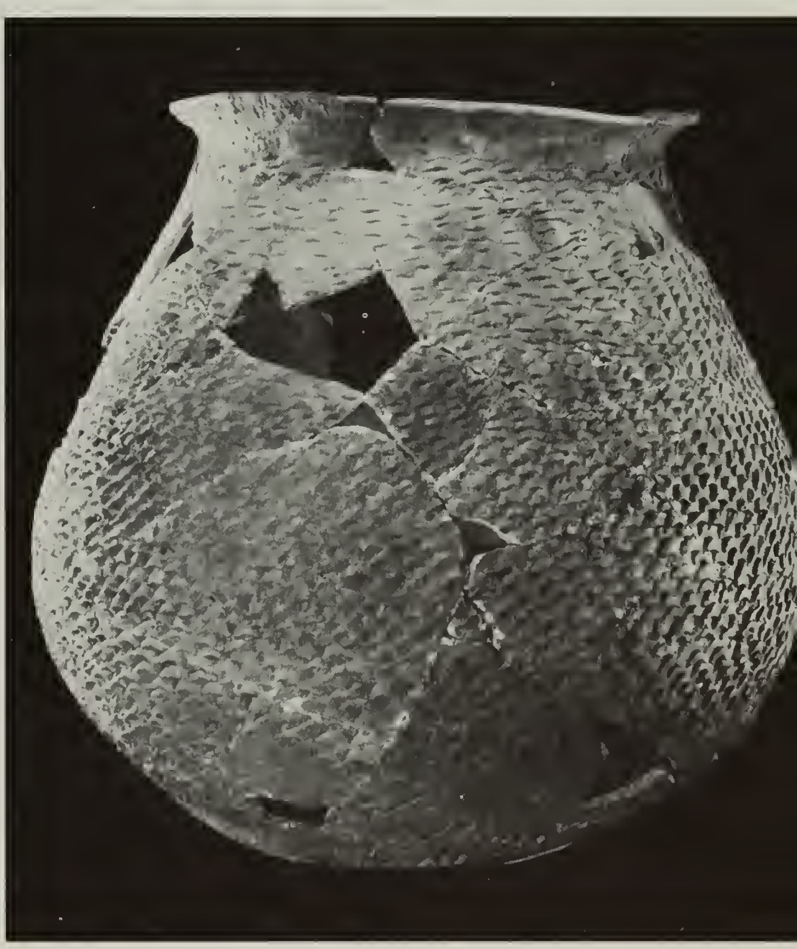
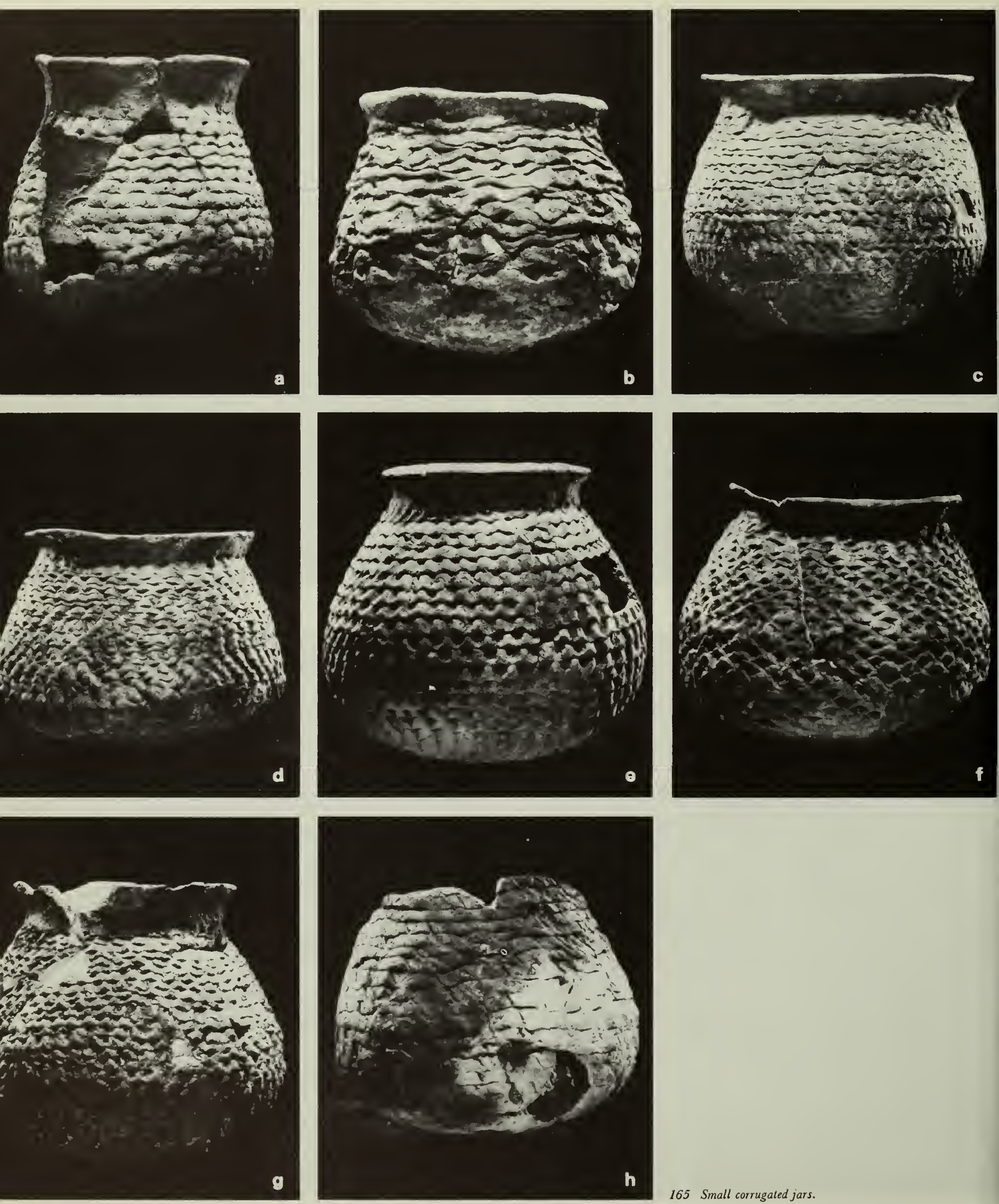
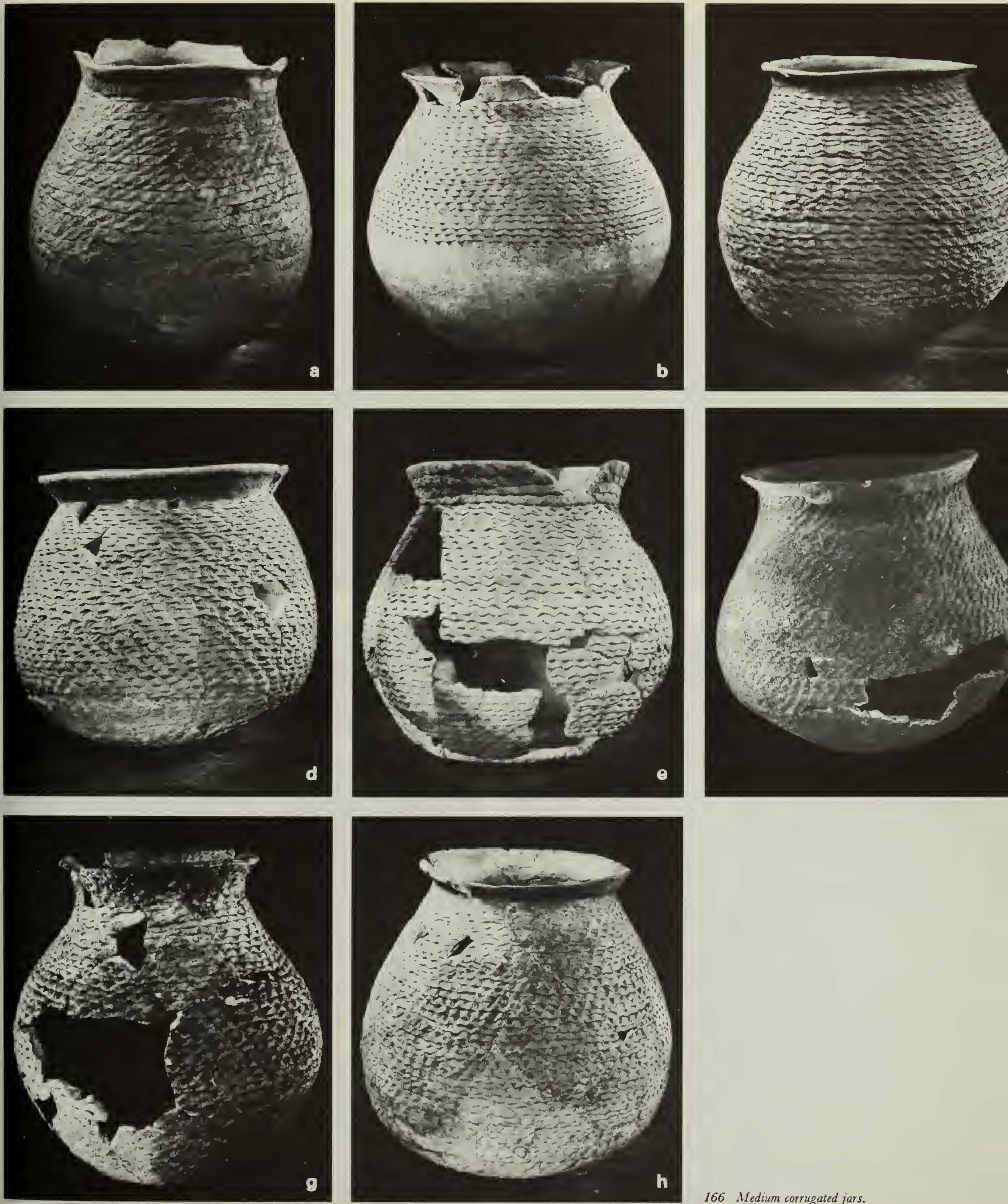


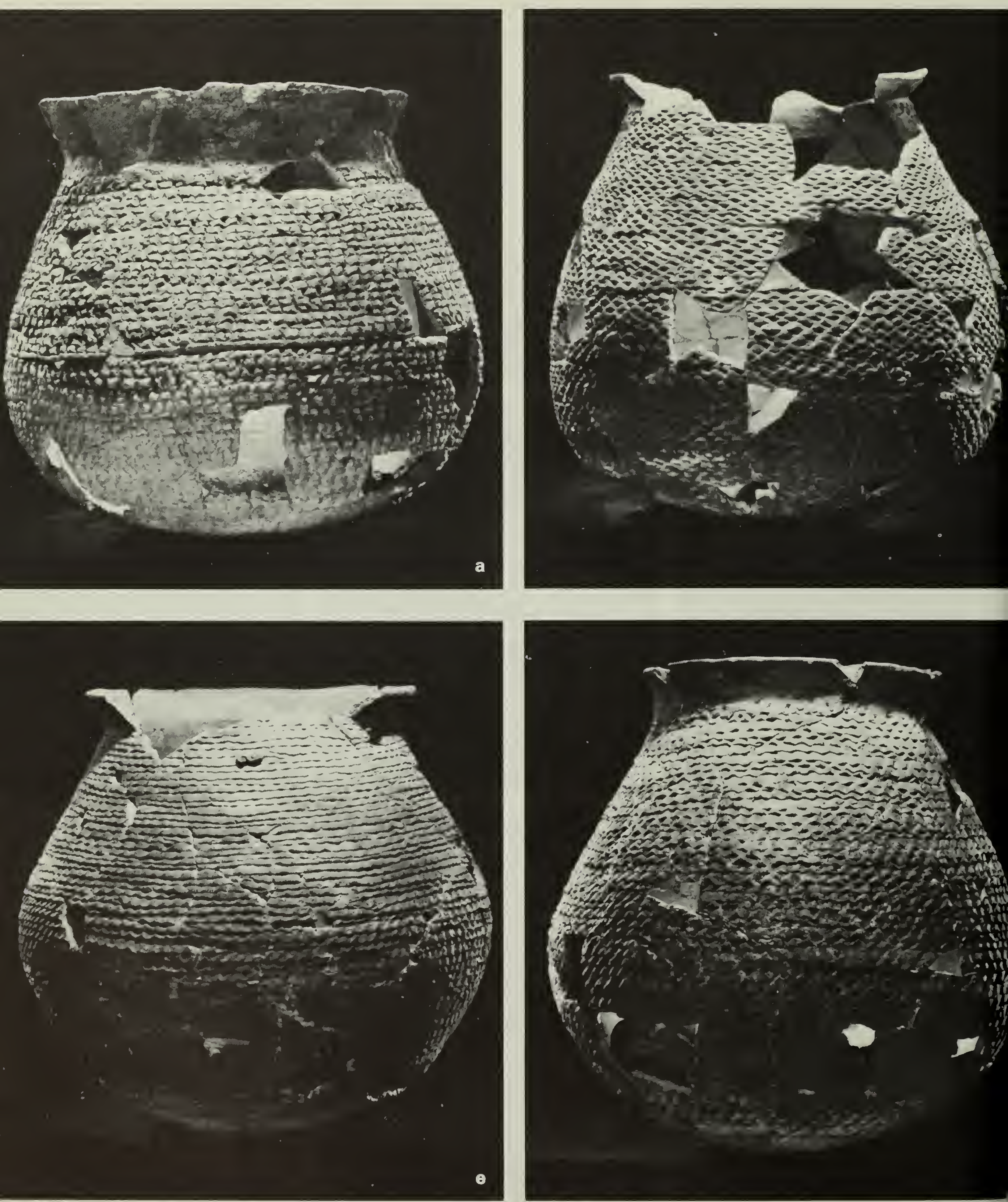


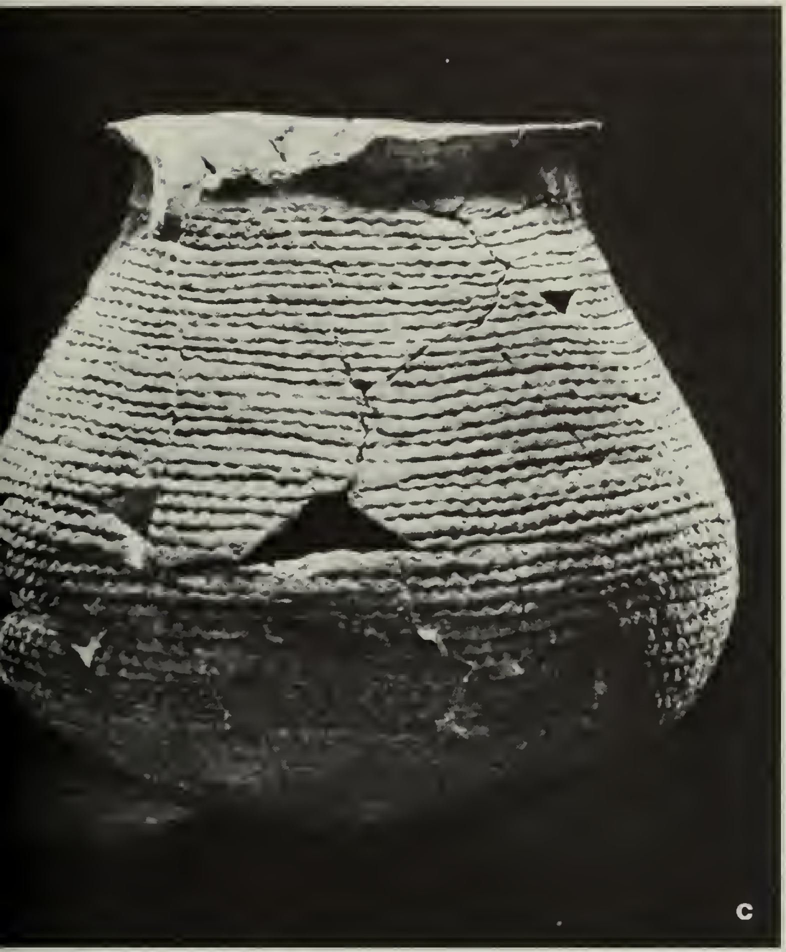
165 Small corrugated jars.



166 Medium corrugated jars.

167 *Large corrugated jars.*





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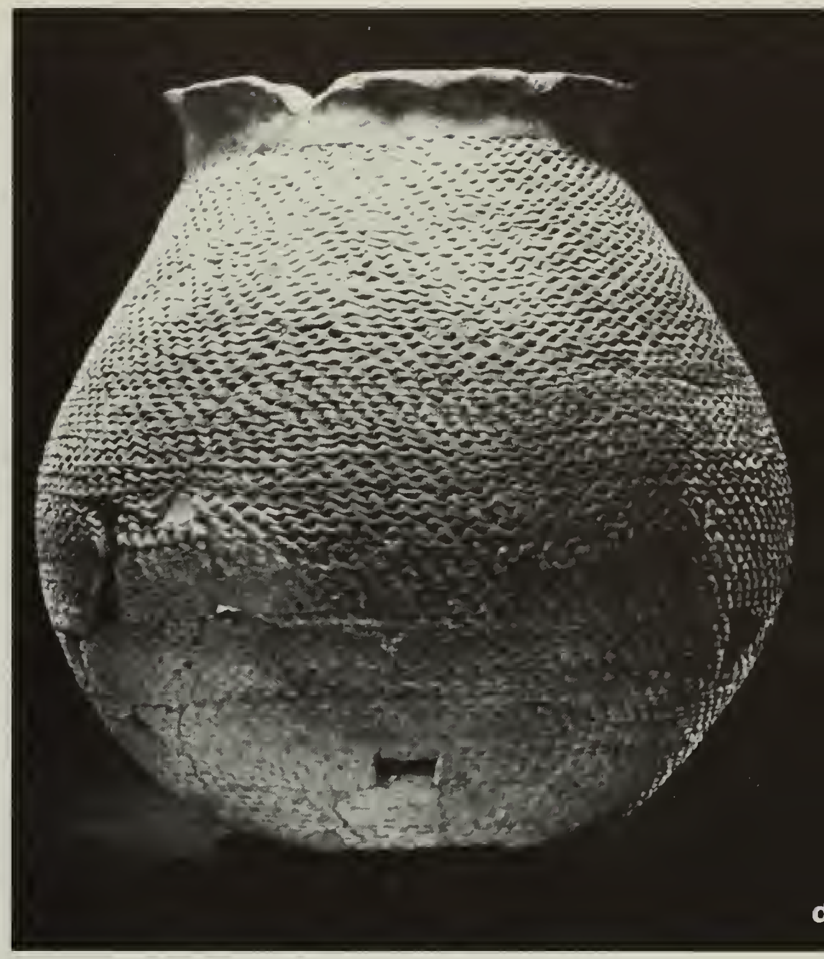

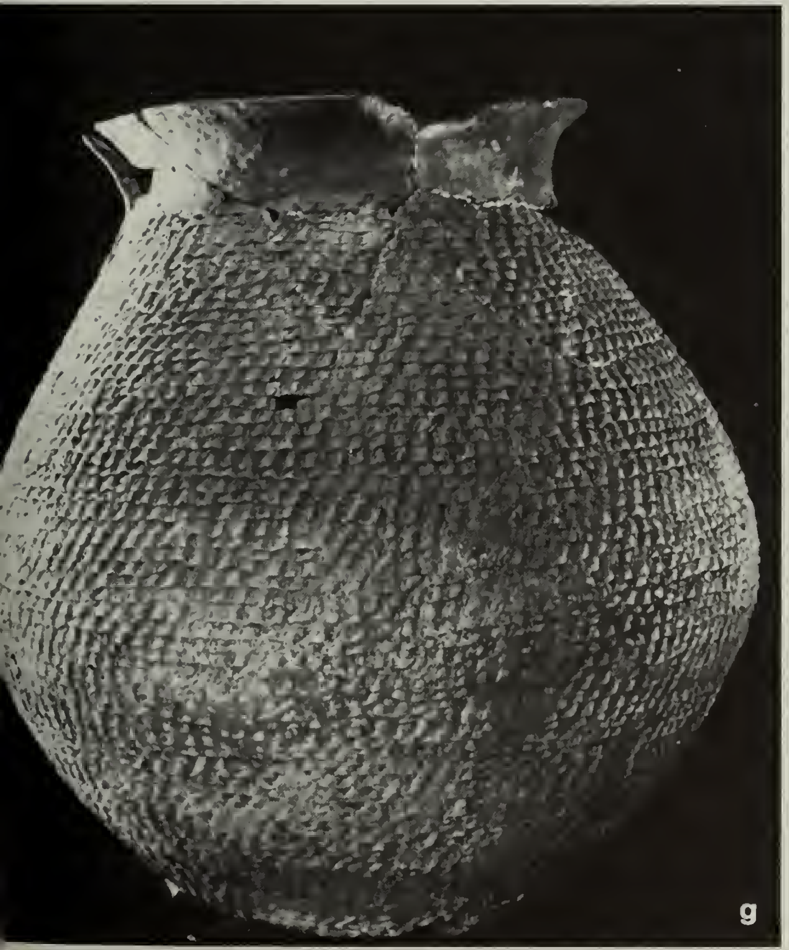

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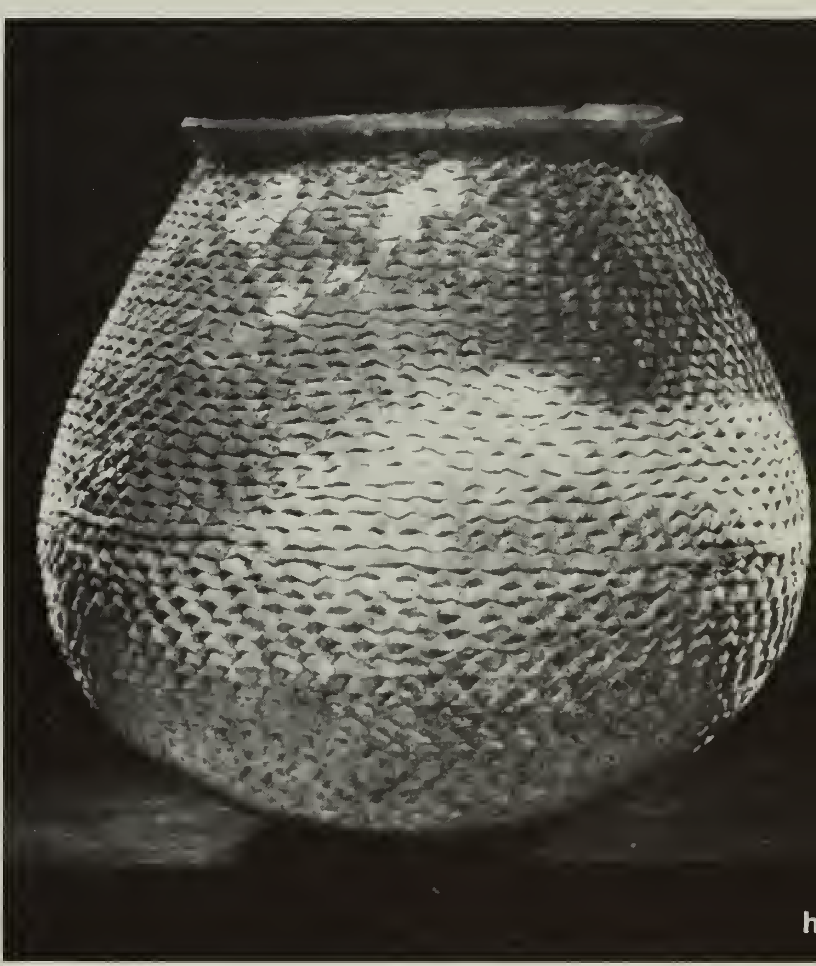

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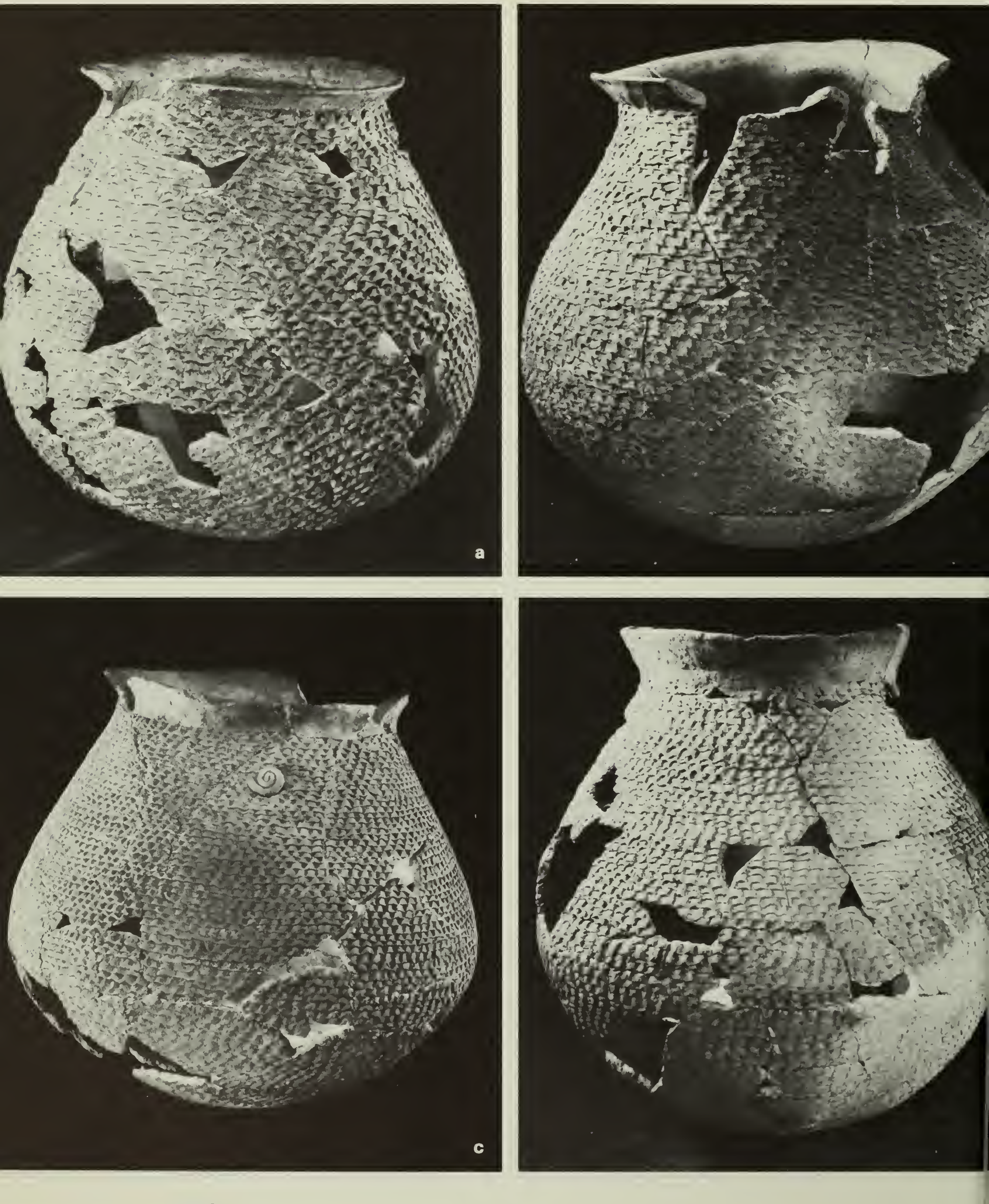
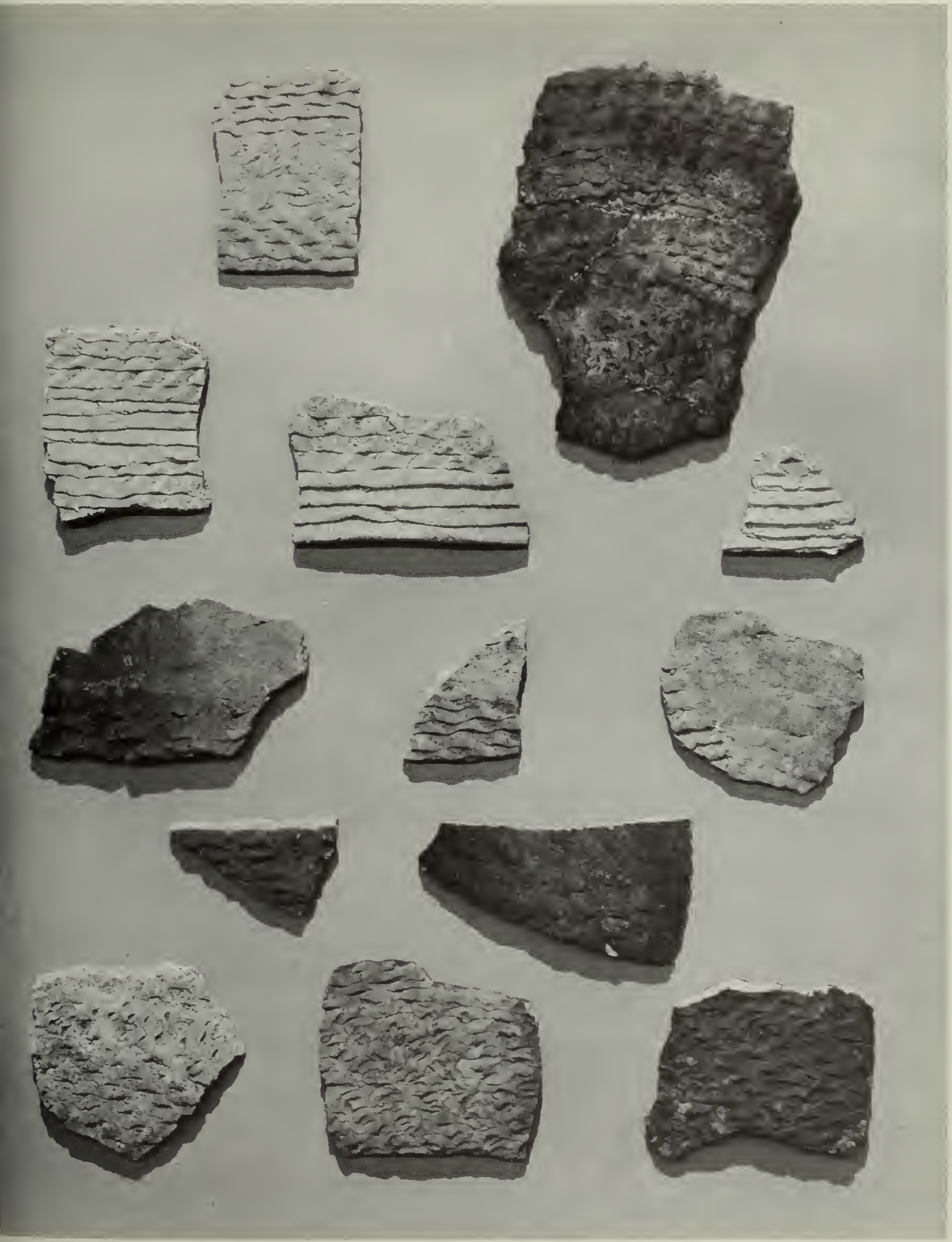
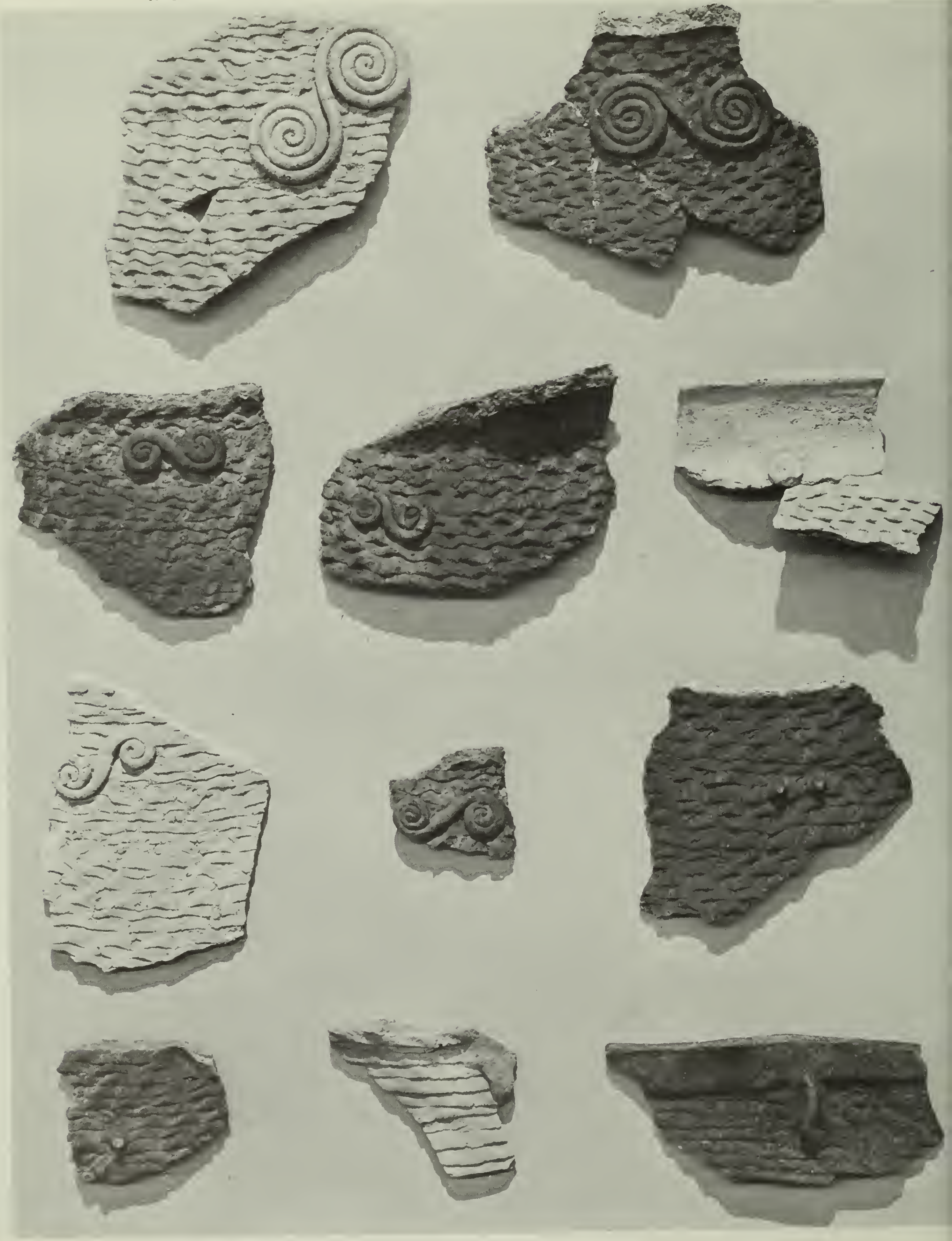
168 Large corrugated jars.

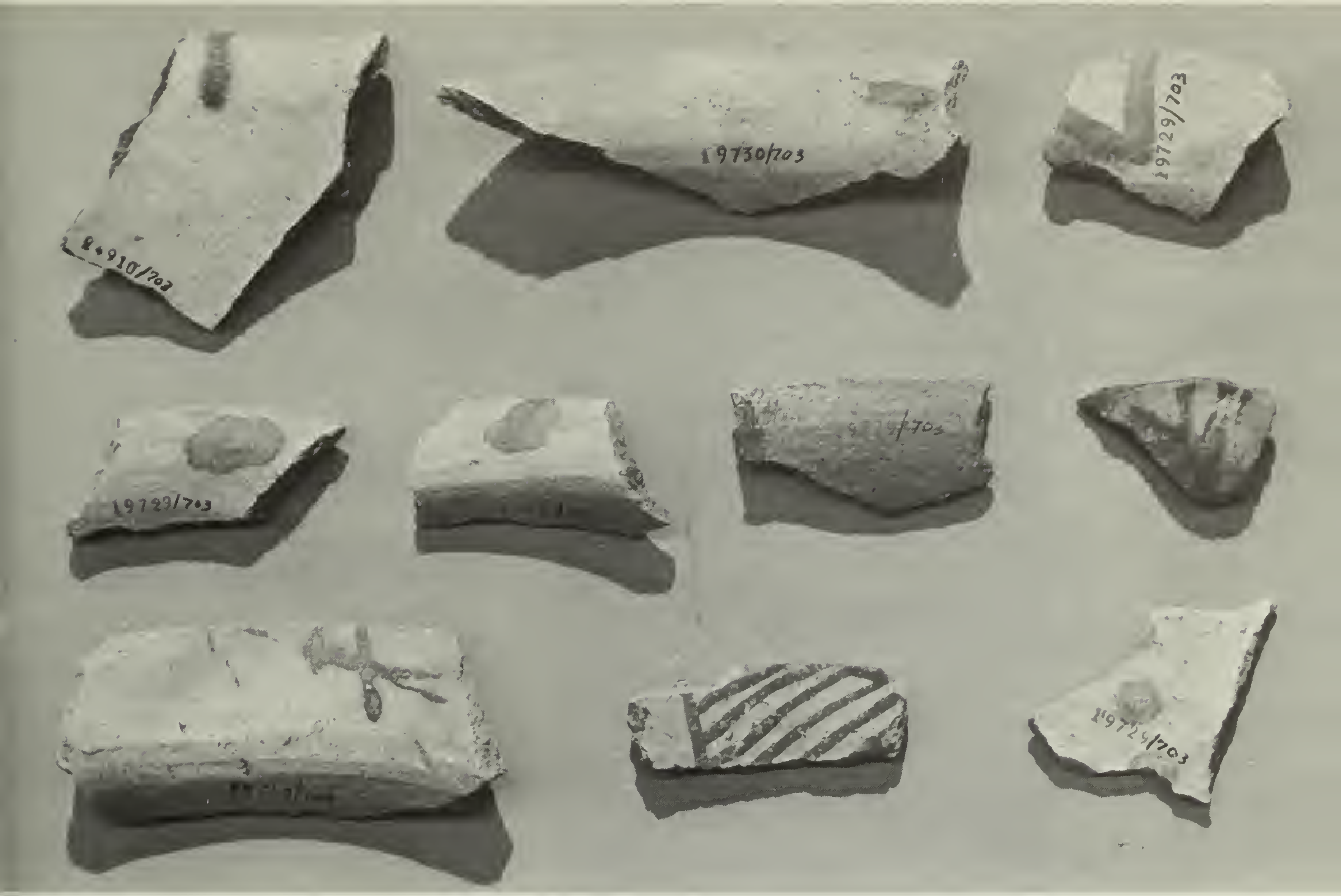


169 *Zone patterning on sherds of Mancos-Mesa Verde Corrugated jars.*



170 *Applique figures on sherds of corrugated jars. Lower right corner is Mancos Corrugated; all others, Mesa Verde Corrugated.*





171 *Painted figures on interior surface of rim sherds of corrugated jars. Sherds in center and right of bottom row are Mancos Corrugated; all others, Mesa Verde Corrugated.*

vessel—three large elongated dots evenly spaced around the rim—and eight sherds, all of which are illustrated in figure 171. These designs were executed in organic paint.

Size. Since a significant aspect of any container is its capacity, we tried to measure or calculate the volume of a large series of the corrugated jars. Only seven were sufficiently intact to allow actual measurement with vermiculite, a lightweight micaceous substance often used for insulation. Therefore, I devised a formula by which an approximate capacity could be calculated from a few key measurements.

In spite of its complexity, the formula can easily be worked for one pot in 3 to 4 minutes, with the aid of a calculator, once the necessary measurements are in hand. Extreme precision is not necessary, for no handcrafted pottery vessel can be made precisely round and symmetrical. Also, the two segments of the pot only approximate the geometric figures for which the component formulae were devised. At present I would limit use of the formula to Mesa Verde Corrugated jars, since the consistent shape of these vessels has determined the specific choice of analogous geometric forms. Appreciation is due to L. D. Anderson and Douglas Osborne for help in working out the formulae.

If a Mesa Verde Corrugated jar were bisected horizontally in the plane of its maximum diameter, the two halves would *approximate* geometric figures whose volume can be calculated by established formulae. The bottom half would approximate a segment of a sphere, almost never a hemisphere, while the upper half resembles a truncated cone. Thus the sum of the following two formulae for the volumes of these two figures should approximate the volume of the vessel:

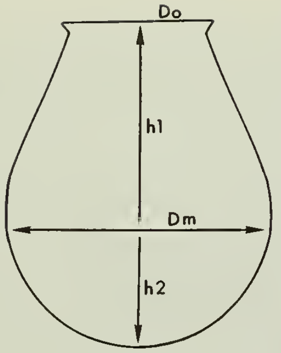
Segment of sphere—$V=\frac{1}{6}\pi h_1(3Rm^2+h_1^2)$
Truncated cone—$V=\frac{1}{3}\pi h_2(Rm^2+RmRo+Ro^2)$

where:

h_1=height from inside of bottom to point of maximum diameter
h_2=height from point of maximum diameter to orifice
$Rm=\frac{1}{2}Dm$ (Dm=maximum inside diameter)
$Ro=\frac{1}{2}Do$ (Do=inside orifice diameter)

When tested on seven jars which could be measured, we found that the actual volumes ran consistently close to 112 percent of the capacity as obtained from the two geometric figures. The complete formula, as I applied it to the Mug House corrugated jars, reads:

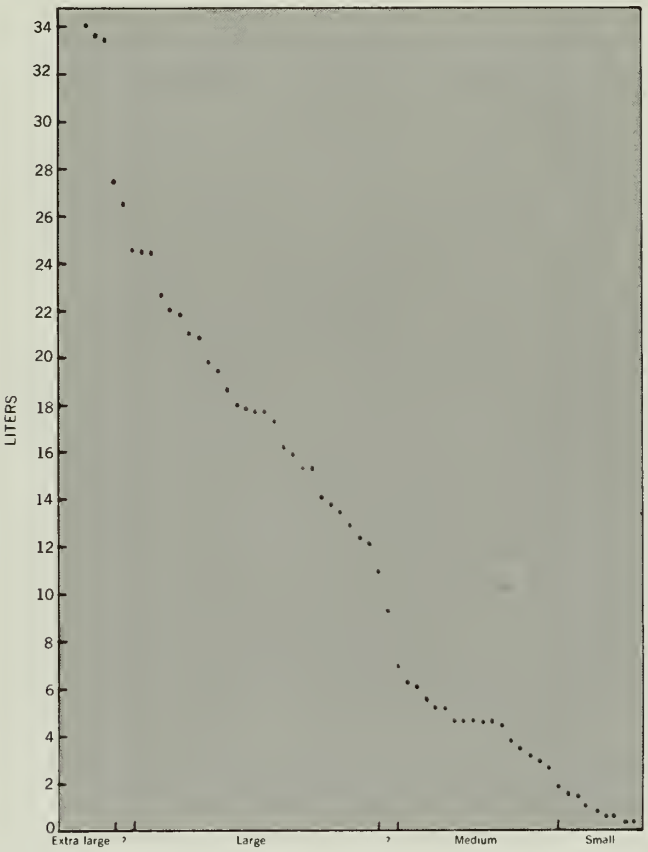
$$\text{Capacity}=[0.524\ h_1\ (3\ Rm^2+h_1^2)]+[1.047\ h_2\ (Rm^2+RmRo+Ro^2)]\times 1.12$$



172 Diagram of measurements needed to compute capacity of a corrugated jar.

The formula requires four measurements: Dm, Do, h_1, and h_2 (fig. 172). All measurements were made in centimeters and the capacities figured in liters. Because of the variations of the pots, the calculated capacities are rounded off to the nearest tenth of a liter.

TABLE 18.—DISTRIBUTION OF CALCULATED OR MEASURED CAPACITIES OF 59 MESA VERDE CORRUGATED JARS IN LITERS



Note: 1 liter is the approximate equivalent of 1.057 liquid quarts.

Capacities were calculated or measured for 59 corrugated jars. When plotted in graph form (table 18), they appear to form four concentrations, strongly suggesting that the vessels were made with general size classes in mind, designated as follows:

Small—less than 2 liters
Medium—2½ to 7 liters
Large—12 to 25 liters
Extra-large—33 to 35 liters

The four vessels that fit between some of the groupings may be explained as errors in judgment or as expressions of some kind of individualism.

The separation between the Small and Medium groups may appear slight in relation to the whole graph, but the percentage increase from the largest Small pot to the smallest Medium pot is actually greater (42 percent from 1.9 to 2.7 liters) than that between the largest Large vessel and smallest Extra-large one (36 percent from 24.6 to 33.5 liters).

The validity of these size classes is further enhanced by correlations in certain overall measurements. Within each class, dimensions may range quite widely, so that they produce no consistent ratio with the volume. However, there is no overlap between size classes in the measurements themselves. The ranges are:

Total height
- Small (0 to 2 liters)—less than 16 cm.
- Medium (2½ to 7 liters)—18 to 25 cm.
- Large (12 to 25 liters)—29 to 39 cm.
- Extra-large (33 to 35 liters)—40 to 44 cm.

Maximum diameter
- Small (0 to 2 liters)—less than 18 cm.
- Medium (2½ to 7 liters)—19 to 25 cm.
- Large (12 to 25 liters)—30 to 38 cm.
- Extra-large (33 to 35 liters)—39 to 41 cm.

Orifice diameter
- Small (0 to 2 liters)—less than 10 cm.
- Medium (2½ to 7 liters)—12 to 15 cm.
- Large (12 to 25 liters)—16 to 20 cm.
- Extra-large (33 to 35 liters)—21 to 22 cm.

This means that it should be possible to determine the size class of a fragmentary corrugated jar if only one measurement can be made or estimated with reasonable accuracy.

Employing this extension, we were able to place 115 corrugated jars in the following size classes:

Size class	Pots with calculated capacities	Pots estimated from dimensions	Totals
Small	9(15%)	6	15(13%)
Medium	17(29%)	12	29(25%)
[Medium to large	2	3	5]
Large	26(44%)	33	59(51%)
[Large to extra-large	2	1	3]
Extra-large	3 (5%)	1	4 (4%)
Totals	59	56	115

Besides capacity, two other measurements appear to have significance. The ratio of total height to maximum diameter ranges from 0.73 to 1.18, but 86 percent of the 86 measurable vessels fall between 0.84 and 1.05. There is a decided tendency for the Small and Medium jars to have lower ratios. The ratio of orifice diameter to maximum diameter ranges from 0.45 to 0.66, with 89 percent of the 81 measurable jars falling between 0.48 and 0.61. Seventy percent cluster between 0.51 and 0.59, which may be considered the typical range for Mesa Verde Corrugated jars. No Large vessels possess a ratio above 0.60. There is a tendency for Medium and Small pots to have higher ratios, probably because the opening had to be big enough to allow a hand to pass into the jar.

Uses. All but 12 of the corrugated jars had particles of soot adhering to their exterior surfaces. This would imply they had served as cooking pots or for heating non-food substances. The few jars (8 Large and 4 Small) without soot may have been used for storage immediately after their manufacture, or simply have been so new that they had not yet been used over the fire. They could have been refired in a building fire that burned off all traces of soot. If this last had happened, there would almost certainly be other definite signs of the refiring present, but none were observed.

Seventeen corrugated jars were found set beneath room floors, courtyard floors, and walking surfaces, most of them covered. In addition, we unearthed two pits from which jars may have been removed. Two storerooms, Rooms 75 and 58, contained the remains of at least five other jars. Most of these (13) belong to the Large and Extra-large size classes. Of the remaining nine, three came from areas on the upper ledge, two from beneath floors of lower cave rooms, and one from under the banquette of Kiva E. Since it is remotely possible that the Large jars beneath Rooms 66, 71, and 49 were placed there when those spaces were parts of courtyards, and since the upper ledge areas are more like rooms than courtyards, there may be a size distinction between those jars placed beneath room floors and those placed beneath courtyard floors: Medium for the rooms and Large and Extra-large for courtyards.

Four of the subfloor jars contained remnants of substances once stored in them. We recovered a double handful of squash seeds from the Medium jar in Area V. Inside a sealed jar of Medium size set below the floor of Room 30 were many casings of beetles that usually feed upon such materials as meal or seeds. Apparently this jar originally contained some sort of foodstuff which had been devoured by the insects. The other two jars, both in Room 71 and both Large size, contained numerous bones of small animals: in one, a mass of shrews, and in the other, parts of several animals and birds. In neither case does it seem likely that the animals were to be used for food.

Of the eight corrugated jars found on kiva floors, two were Small, five Medium, and one Large. Apparently Large jars were not regularly used in kivas, although one had been set beneath the floor of Kiva A and another was found on the floor of Kiva E. Only three corrugated jars, all Small, were used as burial offerings.

On the basis of occurrences within Mug House, I would suggest that Small corrugated jars acted as receptacles for small items of personal property or other objects with a relatively high value, such as ceremonial materials. Those that bear particles of soot may have been used to heat nonedible substances. This suggested purpose would account for all the occurrences of these vessels in Mug House: three as burial offerings, two on the floor of Kiva E, two on the courtyard floors above Kivas E and F, and one each on the floors of Rooms 40 and 62.

Medium-sized jars may have had the widest range of uses. Some were clearly storage jars—six had been set beneath room and courtyard floors and a seventh was built into the banquette of Kiva E. All were coated with soot and probably were used for cooking. They were found in all contexts except in graves. Medium and Small jars were virtually the only sizes used in kivas.

Large jars were used primarily for storage and cooking. Fifteen were found on room floors, three in storerooms. None appeared in graves and only one came from a kiva floor. Both Extra-large jars found in place had been set beneath living area floors.

McElmo-Mesa Verde Black-on-white Vessels—Technology

Decorated pottery from Mug House generally belongs to a class long recognized as typical of the Mesa Verde cliff ruins and usually called Mesa Verde Black-on-white. Much of it, though, if found on earlier sites, would be labeled McElmo Black-on-white by some archeologists. In the Mug House collections, all of these vessels and sherds form a unified group whose similarities far outweigh their differences. They constitute a single type of pottery made by the 13th-century Muguenos.

For taxonomic purposes, I would assign one type name to this group, recognizing two varieties—McElmo and Mesa Verde—in definitive cases, while relegating indeterminate specimens to the type as a whole. To be consistent with the terminology used in the other Wetherill Mesa Project reports, however, I will use the hyphenated name McElmo-Mesa Verde Black-on-white when referring to the whole type or to indeterminate members of the type.

The following description of the physical properties of this ceramic group does not constitute a type description. It is simply a discussion of the characteristics observed on the 294 Mug House pots belonging to this class. Although the data were derived from the whole and restorable vessels, they apply equally to the potsherds. In some cases, a series of sherds was tested when this was more practicable than handling whole vessels.

Laboratory tests such as petrographic analyses of temper and microchemical analyses of pigments were not made on any of the Mug House pottery. Several studies of Mesa Verde region sherds by Anna O. Shepard (Shepard, 1939; Shepard in O'Bryan, 1950, pp. 93–98; Shepard, 1957) answer many of the technological questions posed by the Mug House pottery.

Clay Body. Petrographic studies would help to identify sources of raw materials for Mug House pottery, but they would probably be unable to pinpoint the exact deposits exploited by the potters. Even without such studies we can still infer the general sources. The carbonaceous shales that are common as lenses in the Mesaverde group mix readily with water to produce clays of usable plasticity. We were able to duplicate the appearance of the prehistoric paste by firing processed samples from some of these lenses. Although we found no quarried lenses near Mug House, the presence of ground shale as mortar in some of the masonry walls indicates that the Muguenos were aware of its plastic qualities and knew where to obtain it in considerable quantities.

That the shale was ground and sorted may be postulated from our experimentation. Even though unground shale softened in water, a lumpy, non-homogenous clay resulted. Grinding reduced the lumpiness. But sorting also was required to remove chunks of various impurities such as carbon, calcium carbonate, or sandstone.

Temper. Four major kinds of tempering materials were identified in the restorable vessels under a binocular microscope: crushed potsherds, crushed rock (mostly igneous and metamorphic), crushed sandstone, and

Tempering materials	McElmo B/W (64 vessels)		Mesa Verde B/W (222 vessels)		Indeterminate (8 vessels)		Totals (294 vessels	
	No.	%	No.	%	No.	%	No.	%
Crushed potsherds	52	81	189	85	8	100	249	85
Crush rock (mostly igneous)	41	64	141	64	4	50	186	63
Crushed sandstone	4	6	9	4			13	4
Sand	6	9	20	9			26	9

sand. Since a majority of vessels (173, or 59 percent of 294) contained a combination of two or more kinds of temper, the figures below give the number of occurrences and the proportion of all vessels containing a particular kind of temper.

Potsherds were slightly preferred, but igneous and metamorphic rocks ran a close second, despite the 8 miles they had to be hauled from the nearest source on the southern end of Chapin Mesa near the Mancos River. Potsherds were as handy as the nearby trash dump. Sandstone and sand were as near as the cliff in which Mug House was built. Notice the comparability in the percentages of McElmo Black-on-white and Mesa Verde Black-on-white vessels.

Fourteen kinds or combinations of tempering material were recorded in the 294 vessels. Ninety-two (31 percent) contained only crushed potsherds, many of which came from crushed rock-tempered pots; 26 vessels (9 percent) were tempered with crushed rock. Predominantly crushed sherds with some rock were found in 72 pots (24 percent) and crushed rock with some sherds in 66 (22 percent). Other combinations or kinds of temper include (listed in order of abundance): crushed rock and sand (10—3 percent); crushed rock and sandstone (6—2 percent); crushed sherds and sand (6—2 percent); crushed sherds, rock, and sand (5); crushed sherds and sandstone (4); sand and crushed sherds (2); quartz sand (2); crushed rock, sandstone, and sherds (1); crushed sandstone (1); and fine sand, crushed sandstone, and sherds (1). The last five combinations were seen only in seven Mesa Verde Black-on-white pots.

This compilation of data reveals a distinct pattern of behavior regarding the addition of nonplastics to pottery clay. Whatever material was to be included had to be crushed to a suitable size. Angular particles of potsherds or igneous and metamorphic rocks were apparently preferred whenever possible, and they were found in some quantity in 291 of the 294 pots. Some potters may have felt that sandstone would make an adequate substitute for other kinds of rock if their stock ran out, and sand may likewise have provided an emergency supply. It is possible that the few vessels tempered predominantly with sand, and even crushed sandstone, were manufactured in the Mesa Verde tradition by potters who lived elsewhere in the northern San Juan region.

Core Color. Color of the fired clay body has been determined on a test series of 150 potsherds from various proveniences belonging to the latest component of Mug House, using the Munsell System of Color Notation (1954). Eighty percent of the readings were a neutral gray ranging from N 4/ (dark gray) to N 8/ (white) with 40 percent N 7/ (light gray). Most other readings were also light grays (5Y 6/1, 2.5Y 7/2, 10YR 6/1, 10YR 7/1, 10YR 7/2, 5 YR 6/1). Variant readings of 5Y 6/2 (light olive gray), 10YR 5/2 (grayish brown), 10YR 6/2 (light brownish gray), 10YR 6/3 (pale brown), and 7.5YR 7/2 (pinkish gray) probably represent firing peculiarities, or they may be the result of accidental refiring during a dwelling fire. The only difference noted between McElmo Black-on-white and Mesa Verde Black-on-white sherds is a slight tendency toward the lighter colors (highe values) in the latter. In fact, all of the 10 white determinations (N 8/) were made on Mesa Verde Black-on-white specimens.

Carbon streak was present in 130 vessels and absent in 164 vessels, as shown at bottom of page.

Although some difference can be seen in occurrence between the two varieties, it is hardly significant. What is significant is the indication that the clay was originally carbonaceous and that full oxidation was not accomplished during firing. Several sherds were found which had been accidentally refired when a house or kiva burned. Sherds of this sort account for the browns and pinks listed in the color readings above. They also lack carbon streaks.

	McElmo B/W		Mesa Verde B/W		Indeterminate		Totals	
	No.	%	No.	%	No.	%	No.	%
Carbon streak present	33	52	90	41	7		130	44
Carbon streak absent	31	48	132	59	1		164	56
Totals	64 vessels		222 vessels		8 vessels		294 vessels	

Color ranged from N 3/(very dark gray) to N 5/(gray).

Firing. From all this we may infer that pottery vessels manufactured in Mug House were fired directly in an open fire to which the supply of oxygen was intentionally restricted during the early stages. Probably the firing period was short, with sufficient oxidation in the late stages to burn out all or part of the carbonaceous core. Had high temperatures been maintained over an extended period, a light brownish gray or very pale brown paste would have resulted, as shown by accidentally refired sherds by tests run by Abel for his Mesa Verde pottery classification (Abel, 1955), and by sample firings of our own. The presence of firing clouds on many vessels suggests that fuel was heaped over and around them, and that burning embers frequently fell against them as the overlying fuel was consumed.

Hardness. Vessel wall hardness was measured according to Mohs' scale using the same test sherd series. Ninety percent fell in the 4 to 6 range, with the remainder measuring as hard as 7 and as soft as 3. Most sherds fractured cleanly, very few of them crumbled. Seven hundred years in the ground and the handling during excavation and in the laboratory did not significantly alter the original broken edges.

Construction. Wherever evidence was available, it showed that vessels were constructed by coiling ropes of clay on top of one another and pressing the joints together with the fingers. Final shaping and thinning of the walls was accomplished by scraping the surfaces with an appropriately shaped fragment of pottery or squash rind. Interiors of jars, canteens, and mugs were usually left in this condition. Other surfaces, however, were smoothed and then polished, often to a high luster, using a hard, unyielding tool such as a waterworn pebble. The high polish increased the ability of the pot to hold liquids.

Surface Treatment. Painted surfaces generally received a light gray or white slip, probably made from the same clay as the body. Presence of a slip was noted under the binocular microscope by an abrupt change to a much finer texture and a lighter color than the body. Polishing on unslipped surfaces often produced a pseudo-slip. Two hundred and fifty-one (85 percent) of the 294 vessels bore slips, with a significant difference between the varieties. Ninety-two percent of the Mesa Verde Black-on-white pots were slipped compared to only 63 percent of McElmo Black-on-white. This difference may simply reflect the slightly poorer craftsmanship of McElmo Black-on-white pottery during the 1200's, but it hardly has classificatory value. The degree of surface compaction due to polishing is shown in the crackling of the surfaces on 91 percent of all vessels.

Paint. All but one of the 294 vessels were decorated with carbon paint. Mineral paint appeared on one double mug (fig. 205b) and on only 14 of 8,949 tabulated McElmo-Mesa Verde Black-on-white sherds from Mug House. Five of these are McElmo Black-on-white pieces and nine are Mesa Verde Black-on-white. No combination of mineral and carbon paints occurred on a single specimen. The two distinct tones of carbon paint which were used produced a polychromelike effect on one bowl and several sherds. The carbon paint on some of the fully oxidized sherds is bright red or reddish brown, probably due to the reaction of alkalies in the vegetable juices of the organic paint with iron in the clay body (Shepard, 1957, pp. 385–386).

McElmo-Mesa Verde Black-on-white Bowls

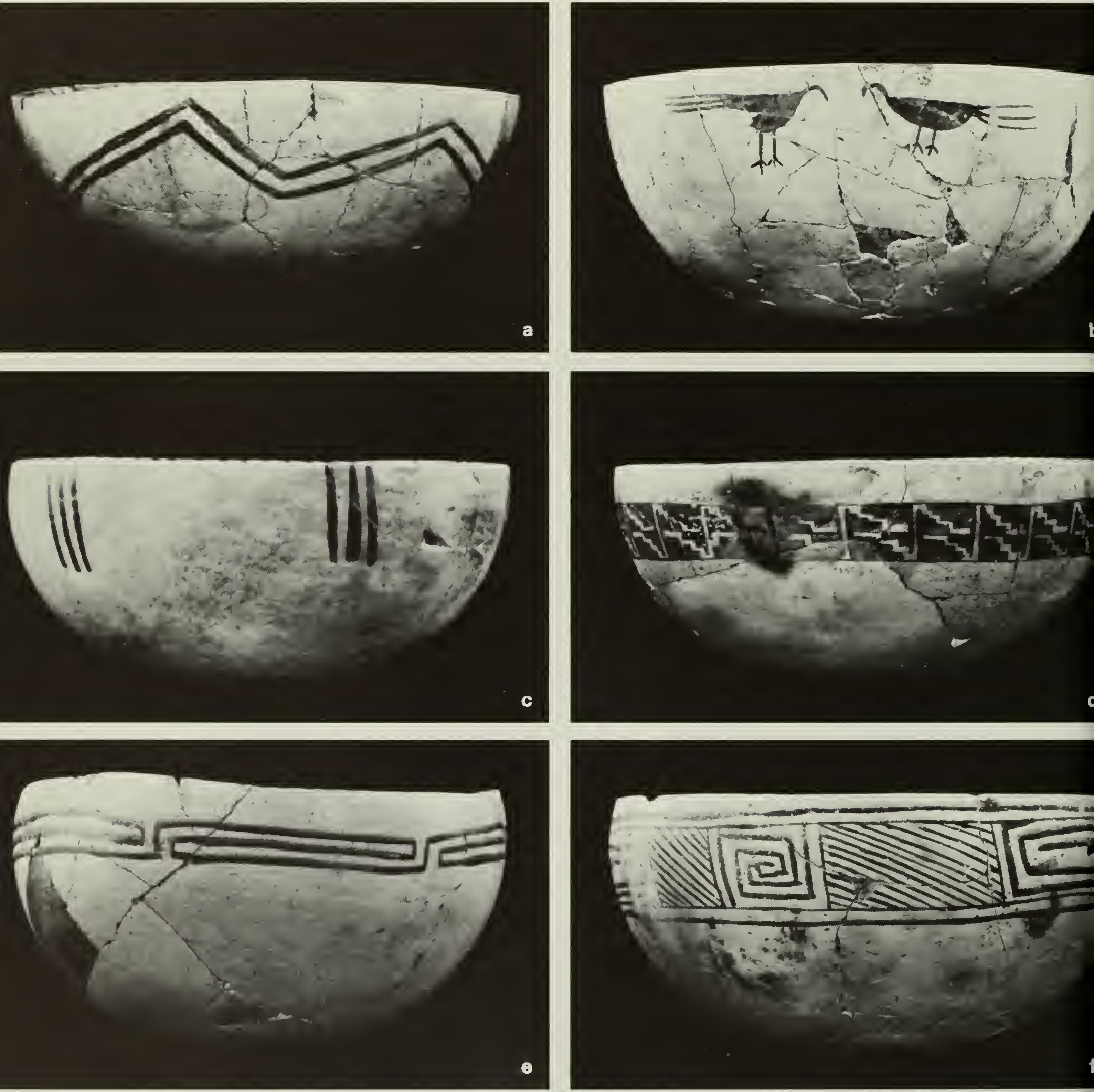
More McElmo-Mesa Verde Black-on-white bowls (170) came from Mug House than any other kind of pottery vessel. Twenty-seven of these were classified as McElmo Black-on-white, 136 as Mesa Verde Black-on-white, and 7 as indeterminate.

Shape. The shapes are remarkably alike. The similarities can be visualized by cutting a horizontal ellipsoid or sphere just below the equator, at the equator, or just above it (fig. 173). The first action would result in slightly flaring upper walls and rims, the second in rim walls with a vertical tangent, and the last in slightly incurving rims. The proportions expressed in the height/diameter ratio show that the vast majority of vessels resembles the lower portions of horizontal ellipsoids. There are a few spheres truncated below the equator. True hemispheres are virtually nonexistent. The modal height/diameter ratio is 0.45, with a range from 0.37 to 0.50. Only seven vessels are above 0.50 and only three are below 0.37.

Variations on these idealized shapes result from flattened bottoms or relatively high vertical sidewalls. Bottoms on 53 bowls (31 percent) range from a flat spot to slight indentation. Four bowl bottoms were indented. More pronounced basal flattening tended to occur on larger vessels. Roundness is best exhibited on small bowls. Large bowls are often slightly asymmetrical around the rim. On 12 large bowls the rim has been pushed inward, sometimes to the point of cracking the vessel wall, producing a highly asymmetrical effect when the bowl is viewed from above. This deformation is so conspicuous as to suggest the potter did it intentionally. It could have been accomplished only while the vessel was still in a plastic state, before reaching the condition of "leather hardness." It is possible that the dents were produced when the freshly formed vessels were left to dry in a crowded corner where other objects would be pressed against them. In that case, such objects would be expected to leave impressions and none of these were found on the vessel walls.

Size. Sorting by size revealed two distinct size classes. The maximum diameters of all bowls, measured to the nearest centimeter, showed two modes—one at 28 cm. and the other at 17 cm. The 87 large bowls (51 percent) ranged from 26 to 32 cm. in diameter, while 76 medium-sized bowl diameters (45 percent) fell between 14 and 22 cm. There were four small bowls of 8, 10, 13, and 13 cm. diameters, and three bowls clustered at 24 cm.

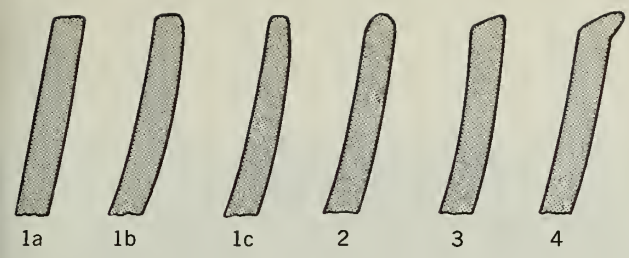
Capacities were measured on 27 of the vessels. Thirteen large bowls held between 4.0 and 6.1 liters, averaging 4.8 liters. The average of six large bowls with modal diameters, however, is 4.3 liters. Eleven medium-sized bowls had an average capacity of 1.2 liters and ranged between 0.6 and 2.0 liters. Three small bowls held 0.36, 0.18, and 0.06 liters.



173 Shapes of McElmo-Mesa Verde Black-on-white bowls.

Rims. The four generalized rim forms are shown in figure 174. By far the most common form is the squared rim with constant wall thickness to the lip (style 1a). Actually, the three silhouettes of style 1 represent extremes of variation within the whole group; style 1c shows the extreme of tapering side walls. Rounded rims (style 2) occur on 10 vessels, 6 of them classified as McElmo Black-on-white.

Beveled rims with an exterior projecting lip (style 4) are common on pottery from northeastern Arizona and are found on three Mesa Verde Black-on-white bowls. Eight sherds—seven Mesa Verde Black-on-white and one McElmo Black-on-white—also have this rim form. Two bowl rims were beveled on the interior (style 3), in a sort of compromise between styles 1 and 4. This style has been noted on Mesa Verde-like pottery from the Glen Canyon area.



174 Rim forms of McElmo-Mesa Verde Black-on-white bowls.

Handles. The restorable bowls from Mug House do not have handles. A single strap handle near the rim of a bowl sherd came from the trash slope. Even though this is most likely a foreign practice, the McElmo Black-on-white sherd on which it was found looks like typical, locally made pottery.

Decoration. Virtually every surface of the bowls, except the base, was painted. The three fields of decoration—interiors, rims, and exteriors—generally show different kinds of designs. Bowl interiors from the rim to the bottom, or part way to the bottom, carry designs that clearly reflect a culturally controlled style of decoration that has already received a considerable amount of discussion (Shepard, 1948, 1957; Morris, 1939; Leavitt, MS.). Most often this field is restricted to the more vertical portions of the vessel walls, but occasionally it extends almost to the center and, in rare instances, includes the center.

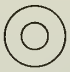
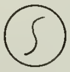
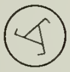
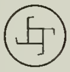
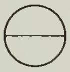
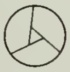
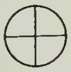
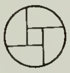
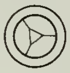
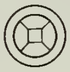
Rims, the second field of decoration, are normally covered with combinations of dots and dashes that may be viewed as line elaborations, if the rim itself is considered a line or a pair of parallel lines. Bowl exteriors, always the near vertical portions, and the center of the bowl interiors, when decorated at all, seem to have been free of rigid cultural limitations. Potters sometimes applied designs typical of the regimented interior style, but often painted entirely unrelated figures.

The Mesa Verde style is characterized by a tendency to subdivide spaces within the decorative field until the resultant pattern is achieved. Symmetry and balance—expressed by decorated versus undecorated spaces, solids versus fine lines—are a part of every decoration.

Band layouts predominate, occurring on 136 bowl interiors (80 percent). Centered designs and sectored fields occur in about equal quantities as shown in the table below. Two bowls, with both a band and a sectored layout, are unusual. The two miscellaneous layouts appear to be simple elaborations of centered designs.

While band layouts predominate in both varieties, it might be noted that the McElmo vessels include relatively larger proportions of Halved, Quartered, and Offset Quartered arrangements. These layouts are common on earlier pottery, but gradually give way to the preponderance of bands and centered designs found on late Mesa Verde pottery.

Nearly all of these layouts leave some small space in the center of the bowl that is either undecorated or carries a small independent figure. Only nine bowls included the center in their primary layout (five Halved, two 2-part Centered, and two Quartered). Six of these are McElmo Black-on-white and two Mesa Verde Black-on-white. One 3-part Centered bowl contains a center design adapted to the primary decoration.

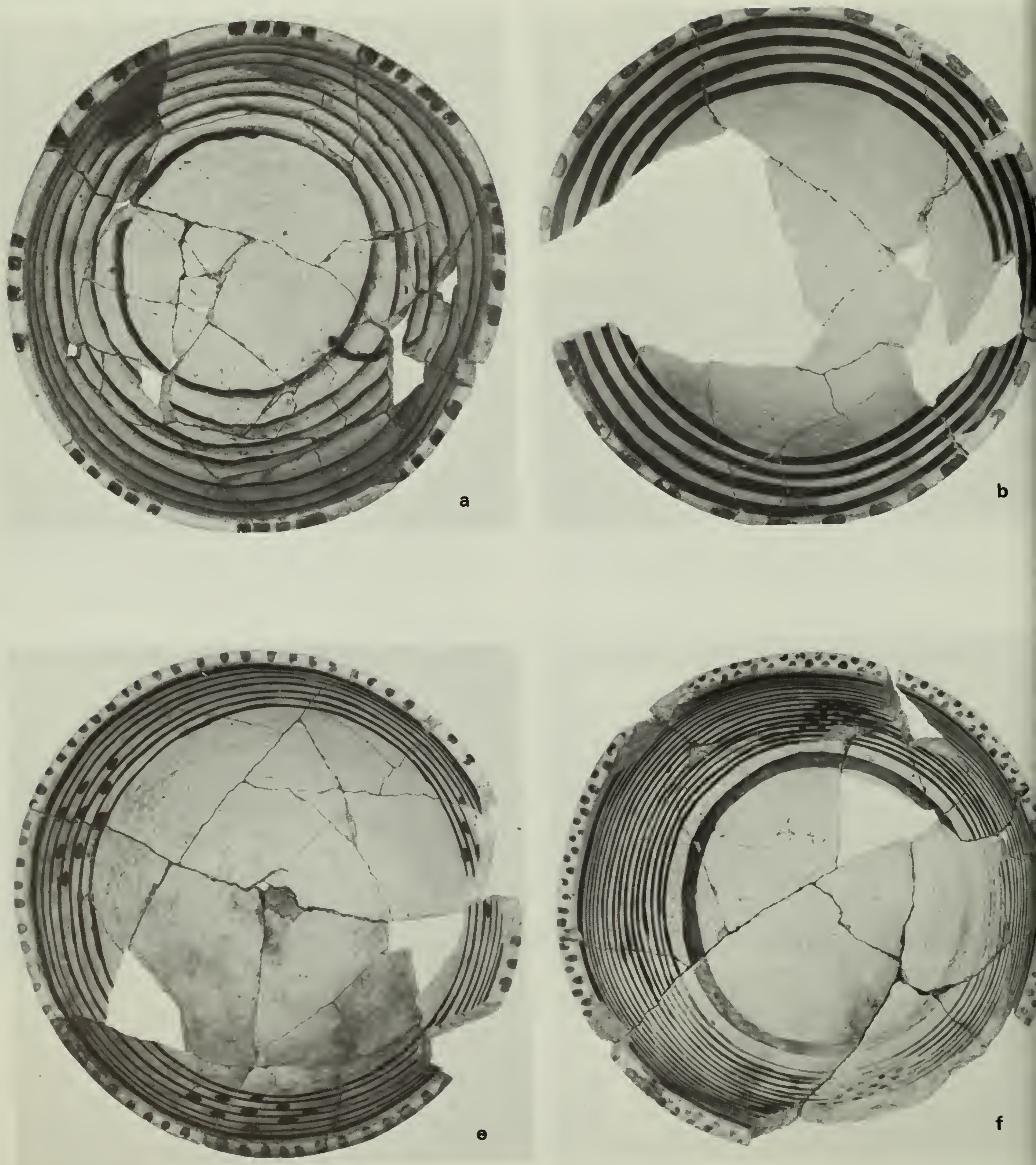
Kind of layout		Mesa Verde B/W	McElmo B/W	Indeterminate	Totals
Band..................		115	16	5	136
Centered—2 part.......		3	....	......	3
3 part.......		9	1	......	10
4 part.......		2	....	1	3
Sectored Halved........		1	4	1	6
Offset Trisected......		3	....	......	3
Quartered......		......	2	......	2
Offset Quartered......		1	2	......	3
Band & sectored (3)....		1	....	......	1
Band & sectored (4)....		1	....	......	1
Miscellaneous..................		......	2	......	2
Totals.....................		136	27	7	170

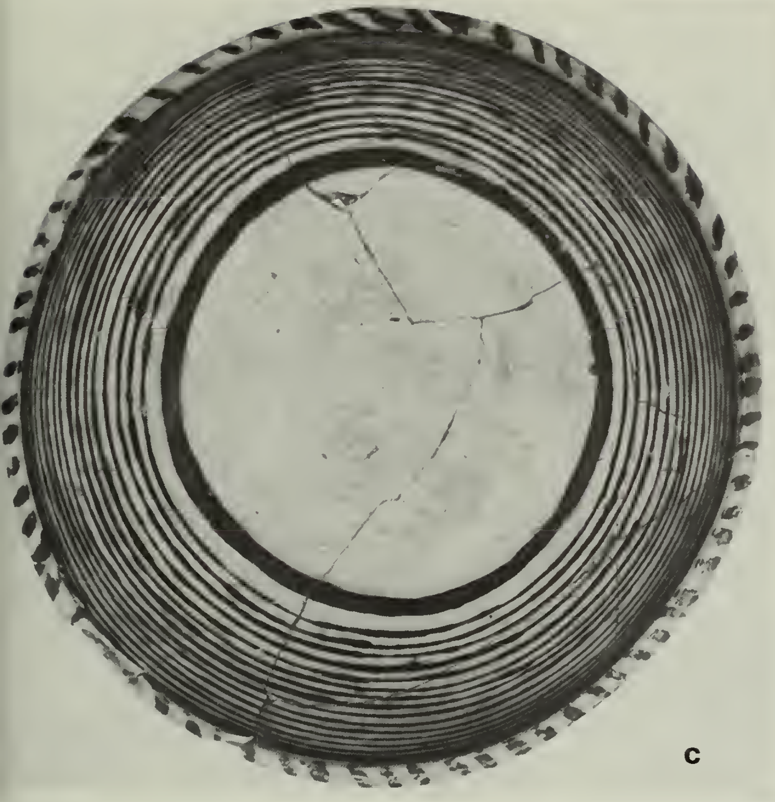
The simplest and most common band design consists of a series of parallel lines below the rim forming a series of concentric circles when viewed from above (figs. 175 and 177a). Broad and narrow lines were used in various combinations and frequently elaborated with dots placed between lines or adjacent to them. In only one case were oblique lines used together with dots as a form of elaboration. Forty-four (26 percent) of all McElmo-Mesa Verde Black-on-white bowls carried this parallel-line band design; 15 were elaborated.

A group of narrow lines between two broad ones (fig. 175 c–d) occurred on 25 vessels. From 4 to 18 narrow lines were drawn, although 8, 9, 12, and 15 were most popular. All but two of these designs occur on 1.2-liter class bowls, one of the others on a 4.3-liter vessel, and the last on a small bowl. A slight variation was achieved by omitting the bottom broad line in five instances (fig. 175h). One vessel bore only 10 narrow lines; seven others had from 4 to 8 lines of equal width (fig. 175 a–b). Five bowls contained two to three bands of narrow lines separated by groups of broad lines (fig. 176a). All of these belonged to the larger class.

Elaboration through the use of dots produced an effect resembling notes of music sketched on lined paper (fig.

175 *McElmo-Mesa Verde Black-on-white bowl designs: simple band lines.*

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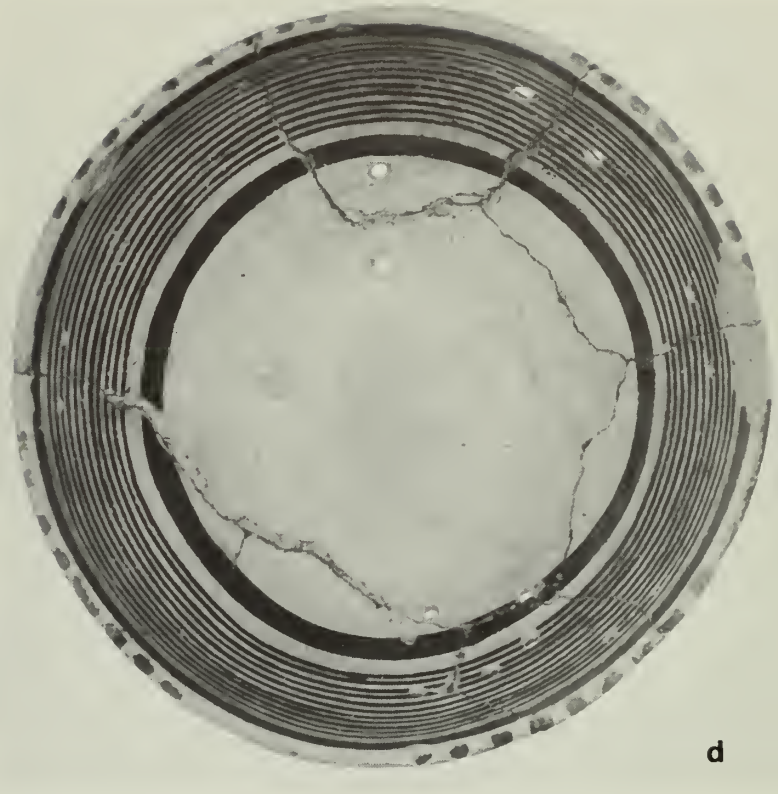
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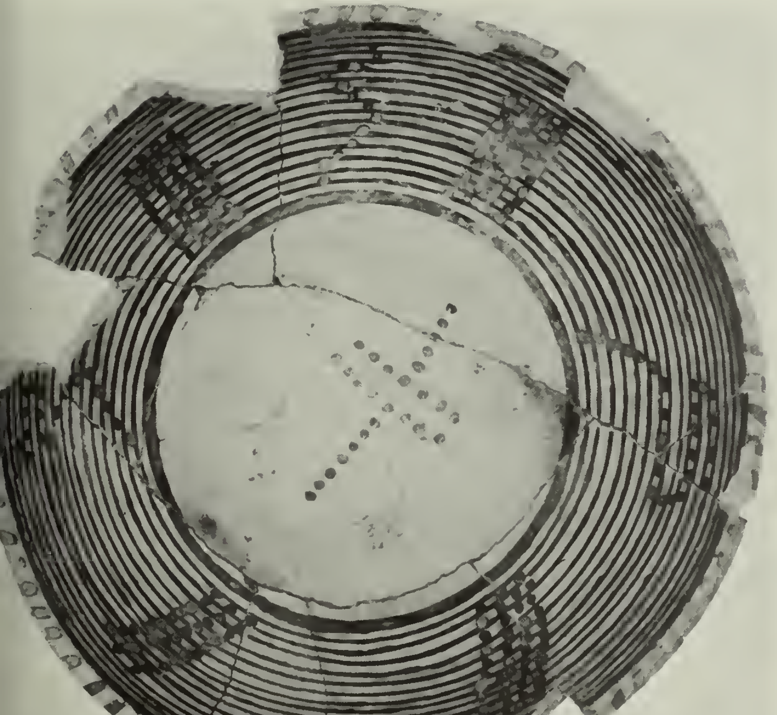
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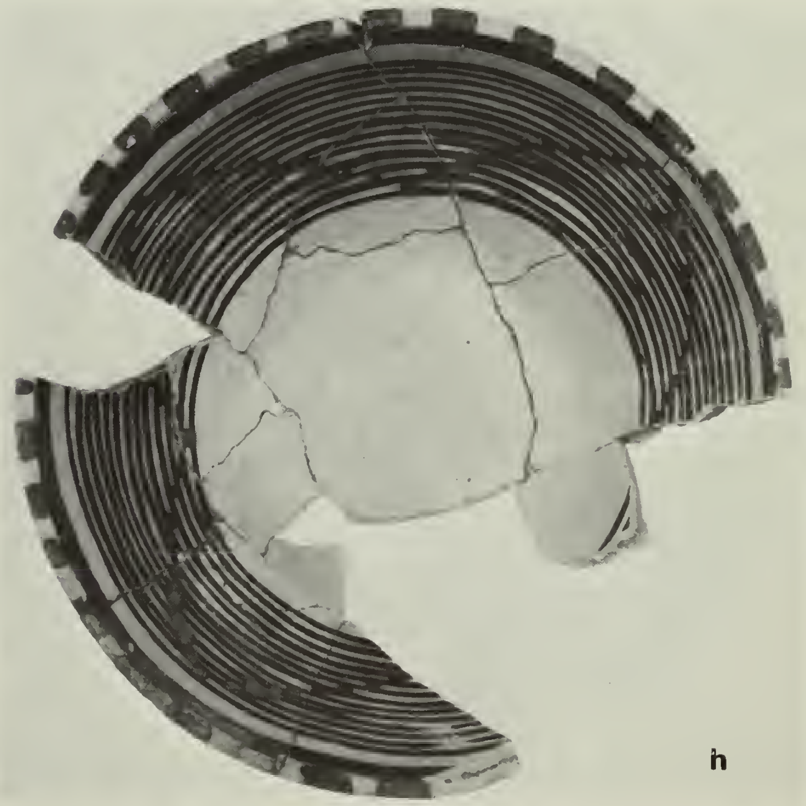
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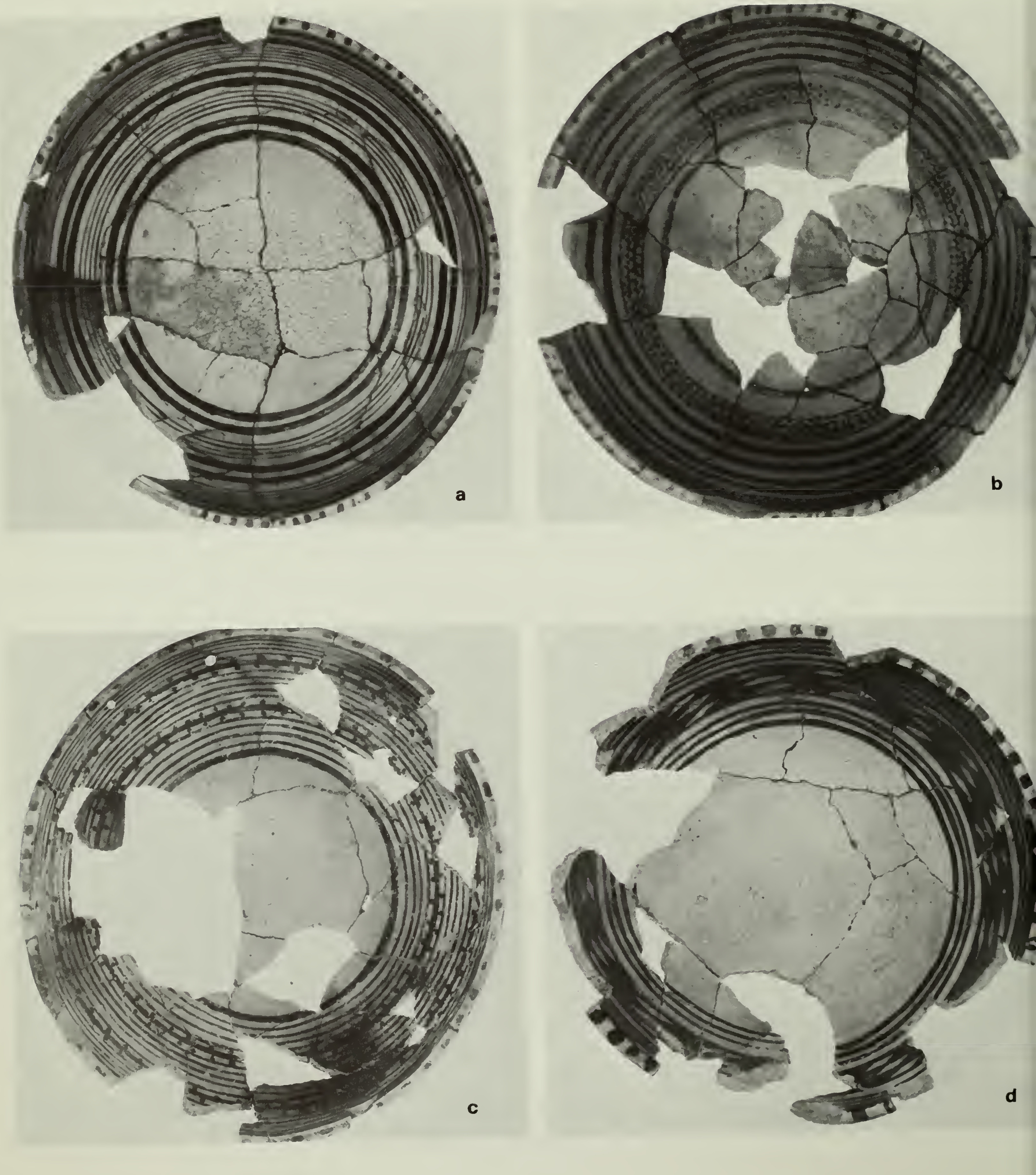
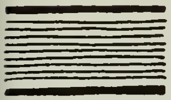
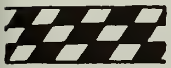
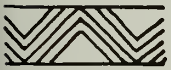
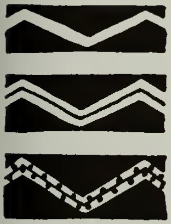
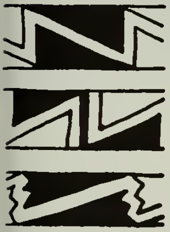
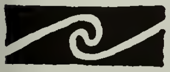
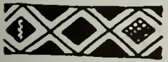
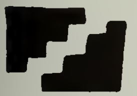
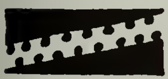
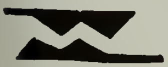
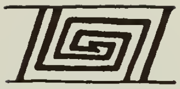
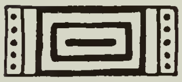
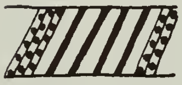
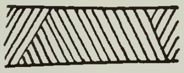
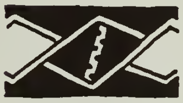
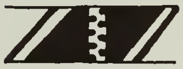
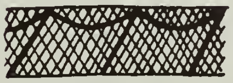
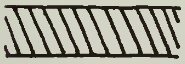
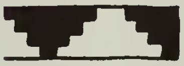
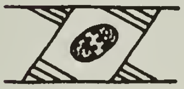
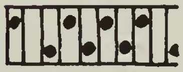
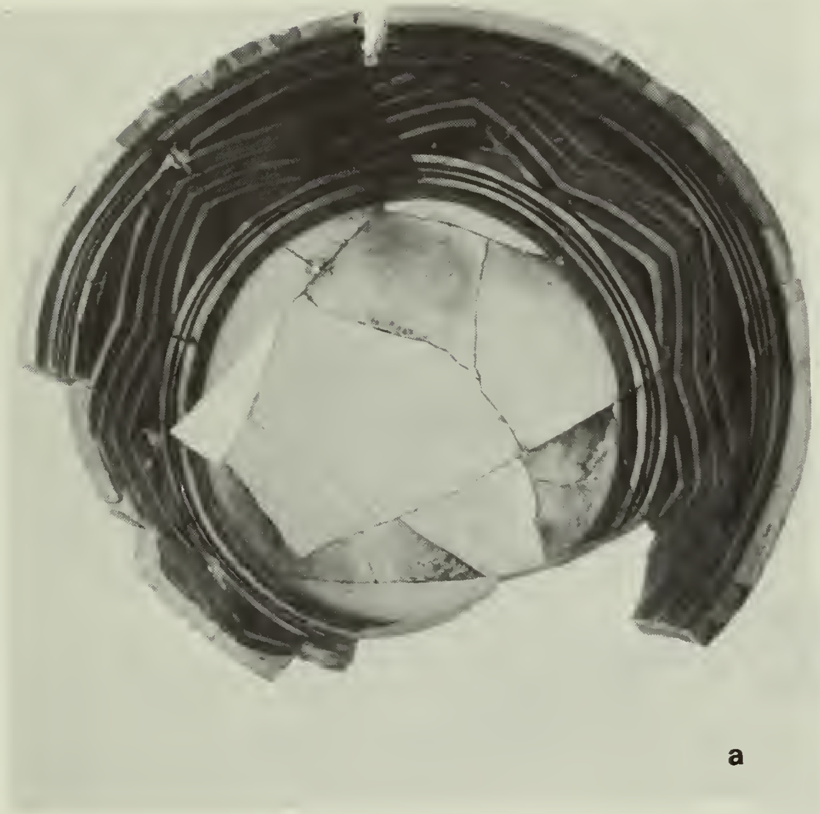
176 *McElmo-Mesa Verde Black-on-white bowl designs: narrow and broad lines.*

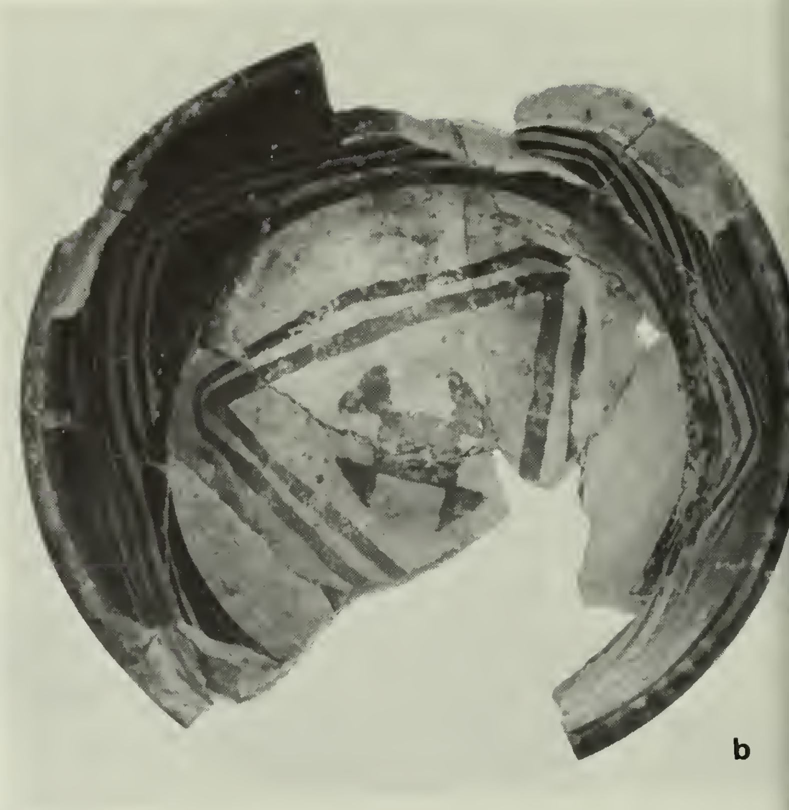


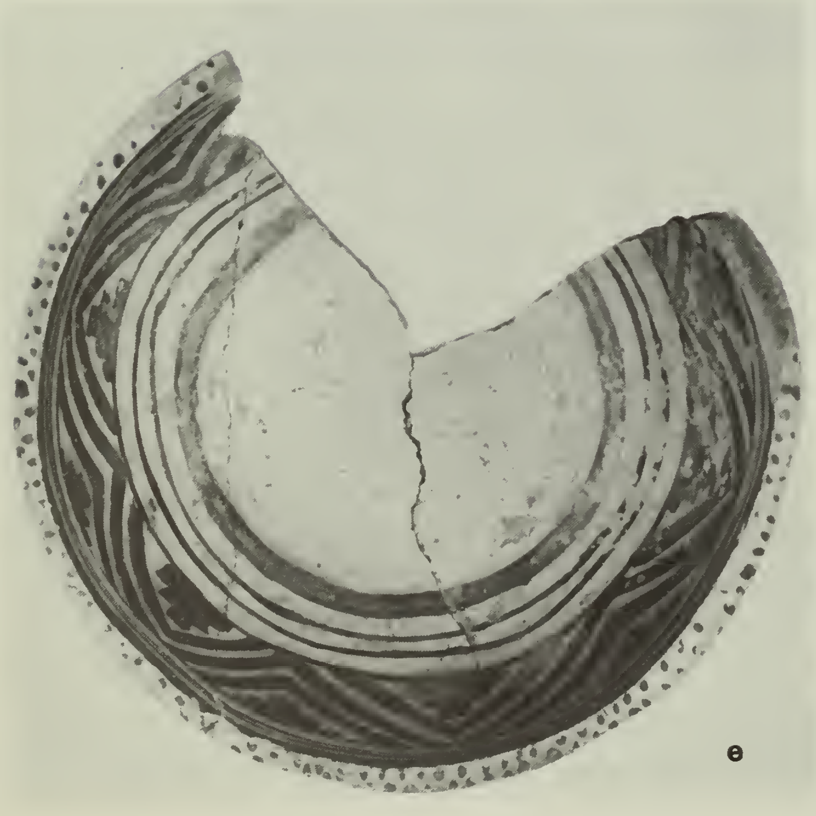
177 Band motifs on McElmo-Mesa Verde Black-on-white bowls.

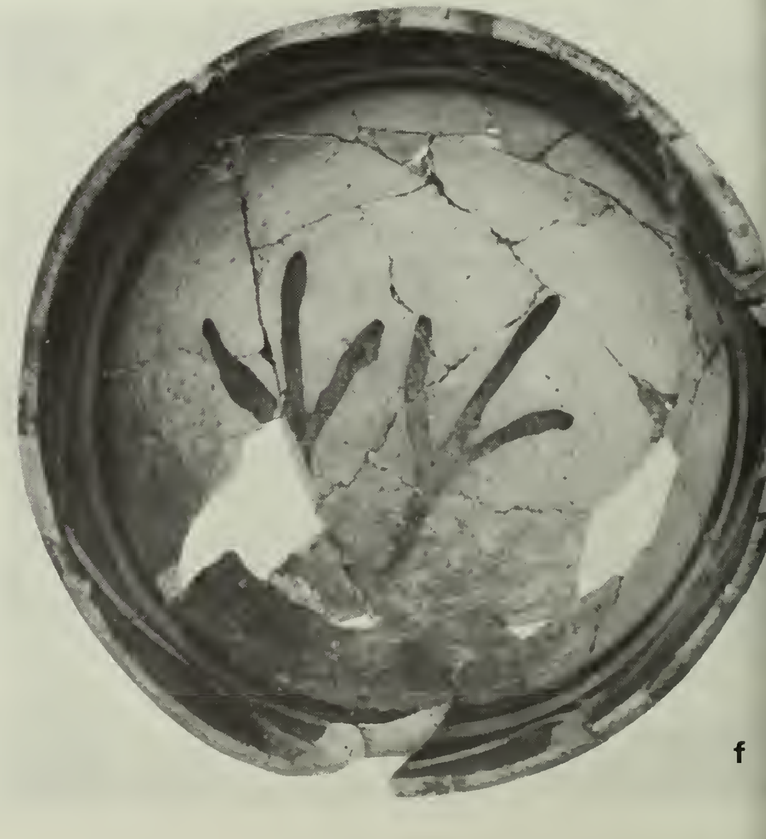
	a	Parallel line	44 interiors 11 exteriors
	b	Oblique checkerboard	4 interiors 1 exterior
	c	Parallel zigzag	7 interiors 5 exteriors
	d	Opposed isosceles triangles (negative zigzag)	5 interiors 3 exteriors
	e	Opposed right triangles (negative zigzag)	5 interiors 1 exterior
	f	Interlocking scrolls	3 interiors
	g	Repeated rhomboids (solid, crosshatched, hatched, space breakers)	2 interiors 2 exteriors
	h	Opposed stepped triangles	37 interiors 5 exteriors
	i	Opposed ticked triangles	10 interiors
	j	Opposed double triangles	1 interior 1 exterior
	k	Interlocking rhomboidal scrolls	1 interior 1 exterior
	l	Concentric rectangles	1 interior
	m	Parallel oblique lines	1 interior 1 exterior
	n	Alternate hatching	1 interior
	o	Negative S-twist	1 interior
	p	Negative Z-twist	1 interior 1 exterior
	q		1 interior 3 exteriors
	r		1 interior
	s	Inverted terraced triangle	1 interior
	t		1 interior
	u		1 interior

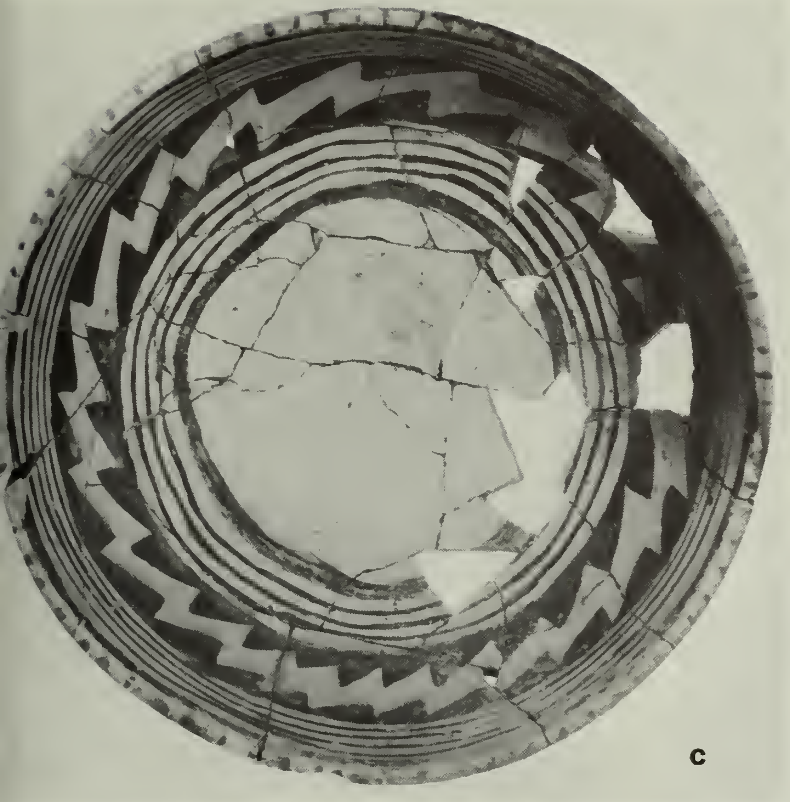
178 McElmo-Mesa Verde Black-on-white bowl designs.











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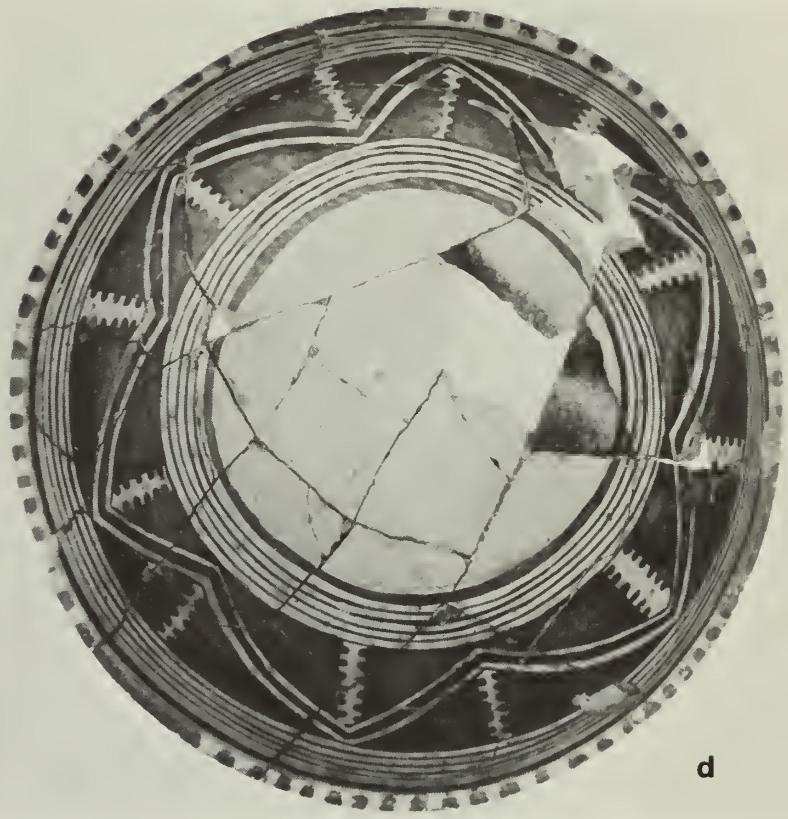

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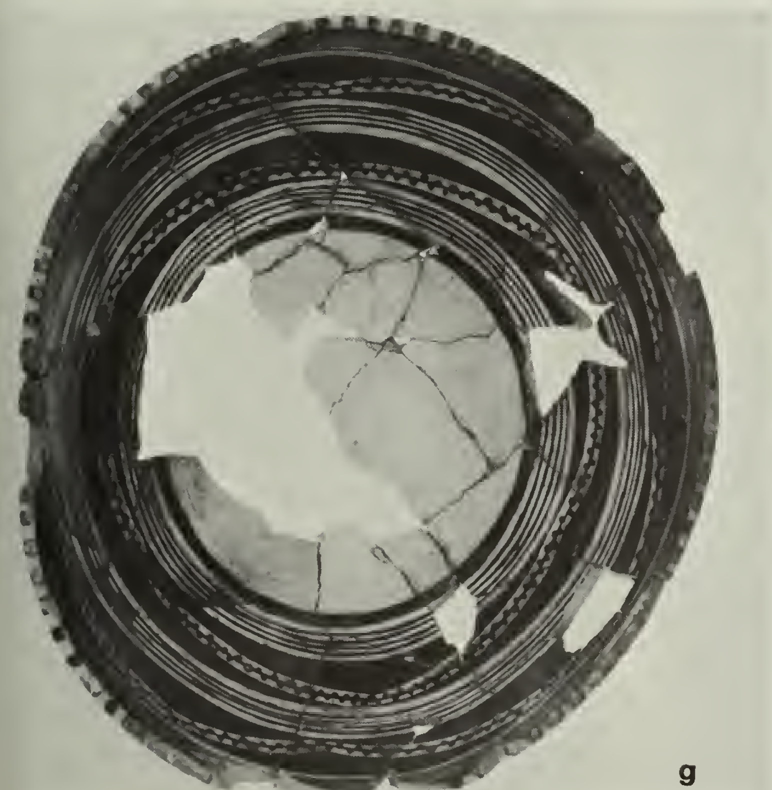

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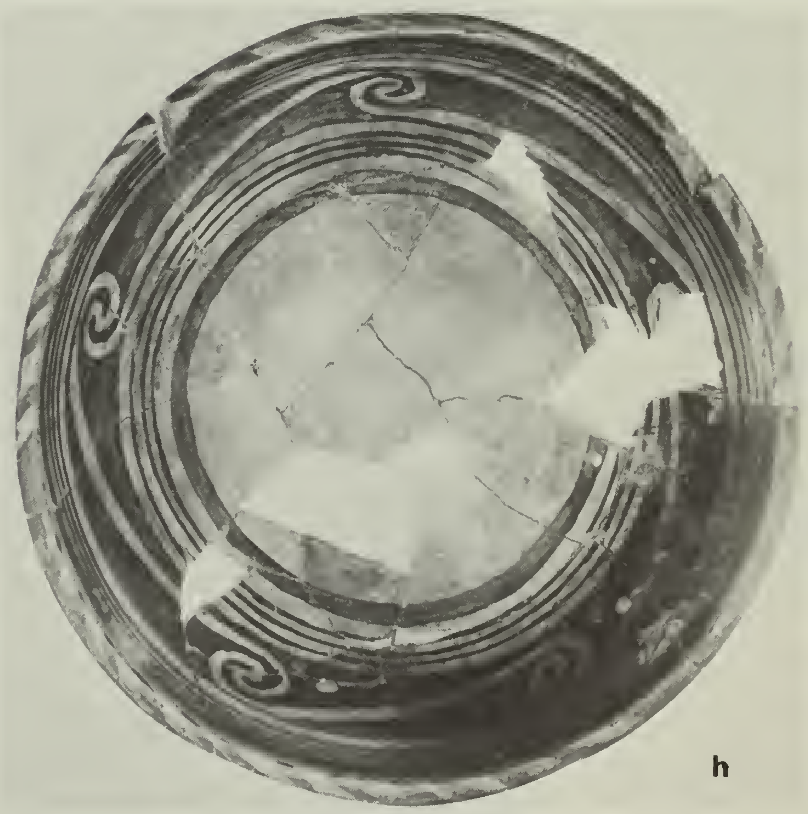

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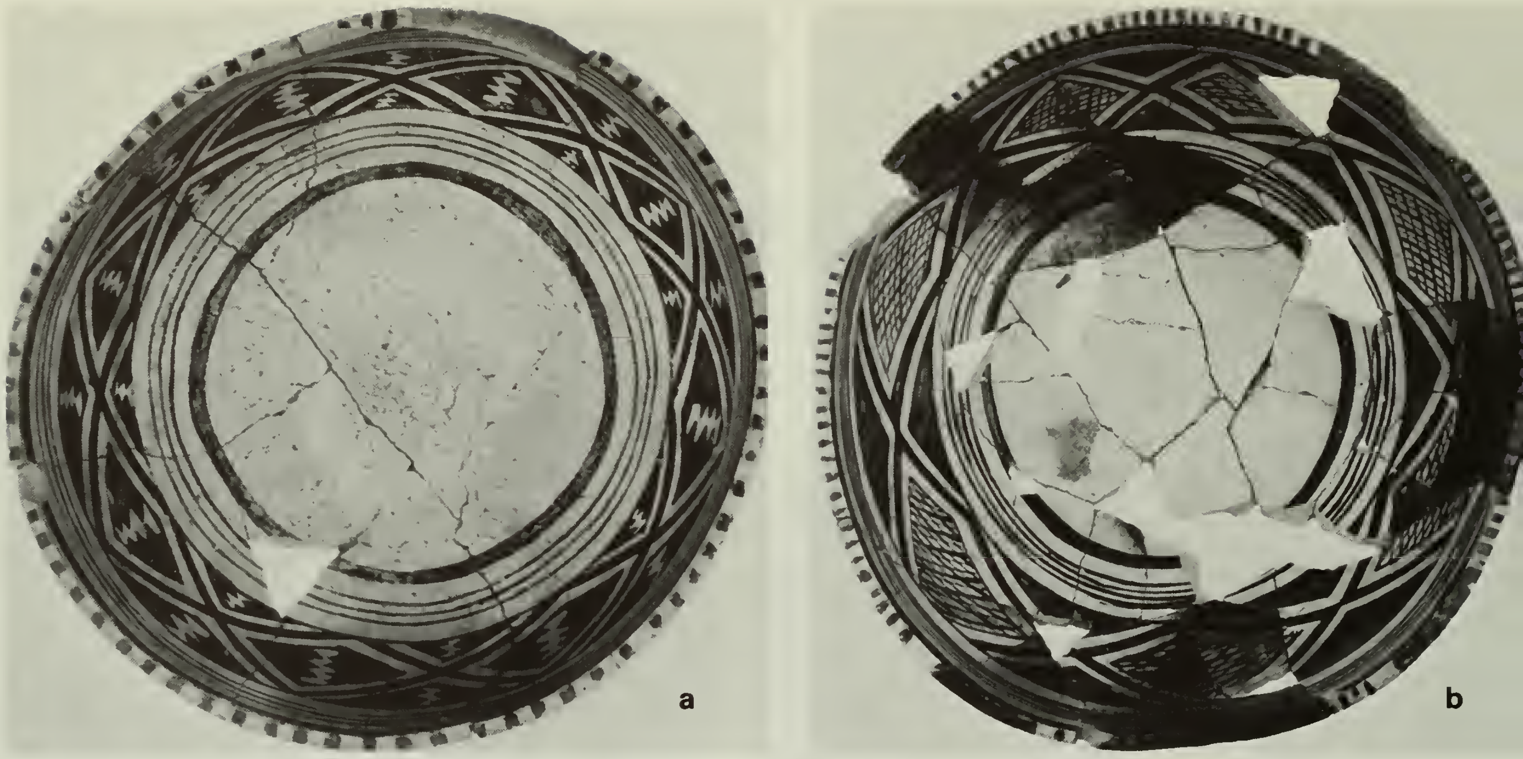
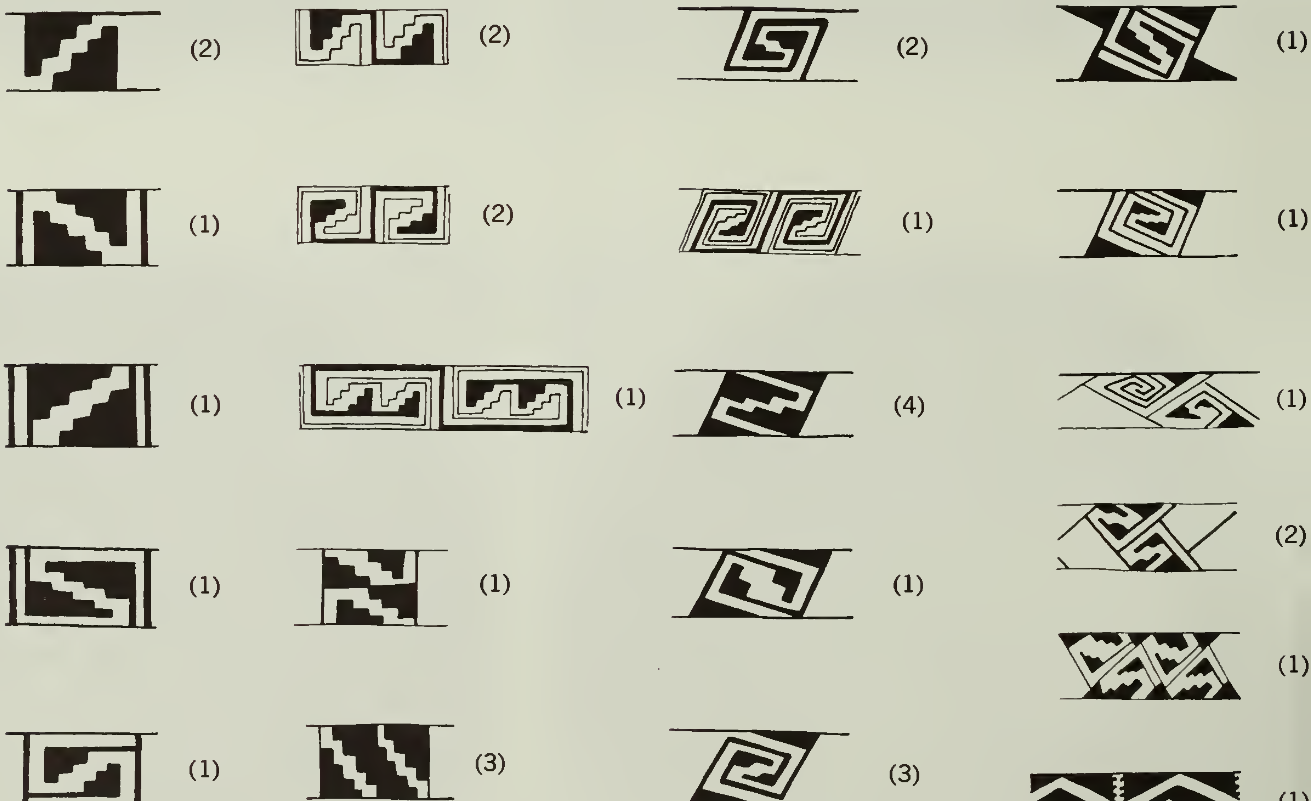


179 McElmo-Mesa Verde Black-on-white bowl designs.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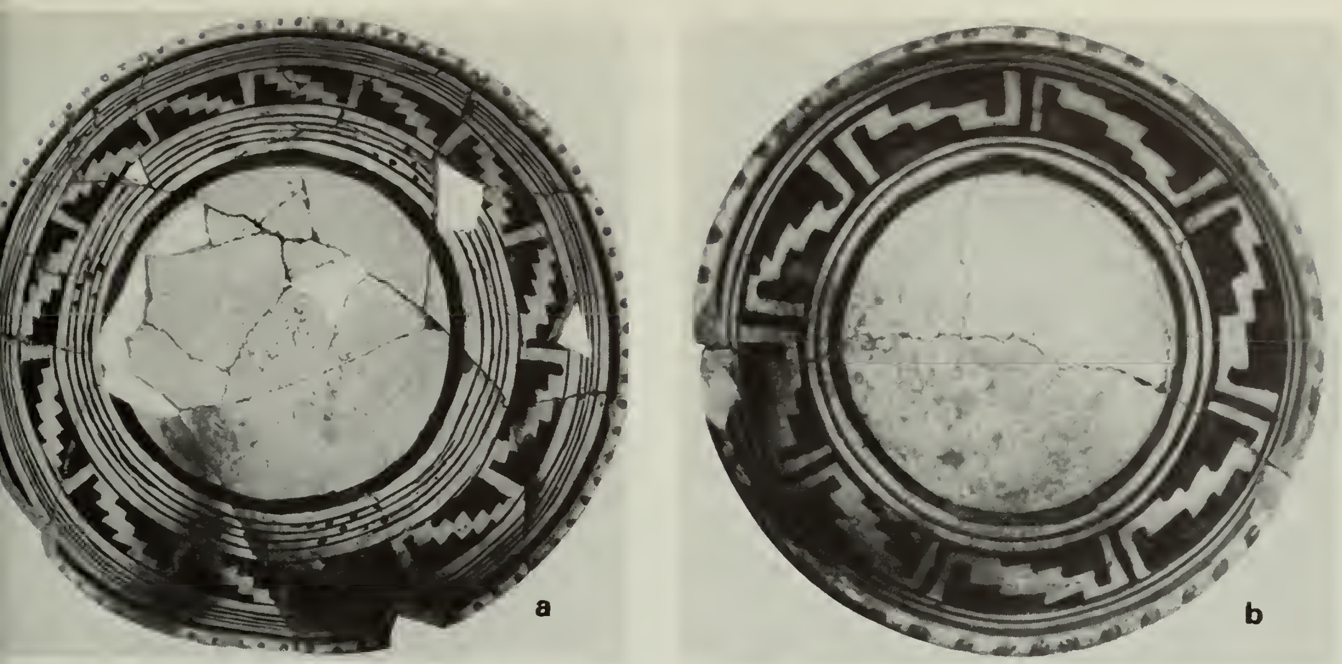
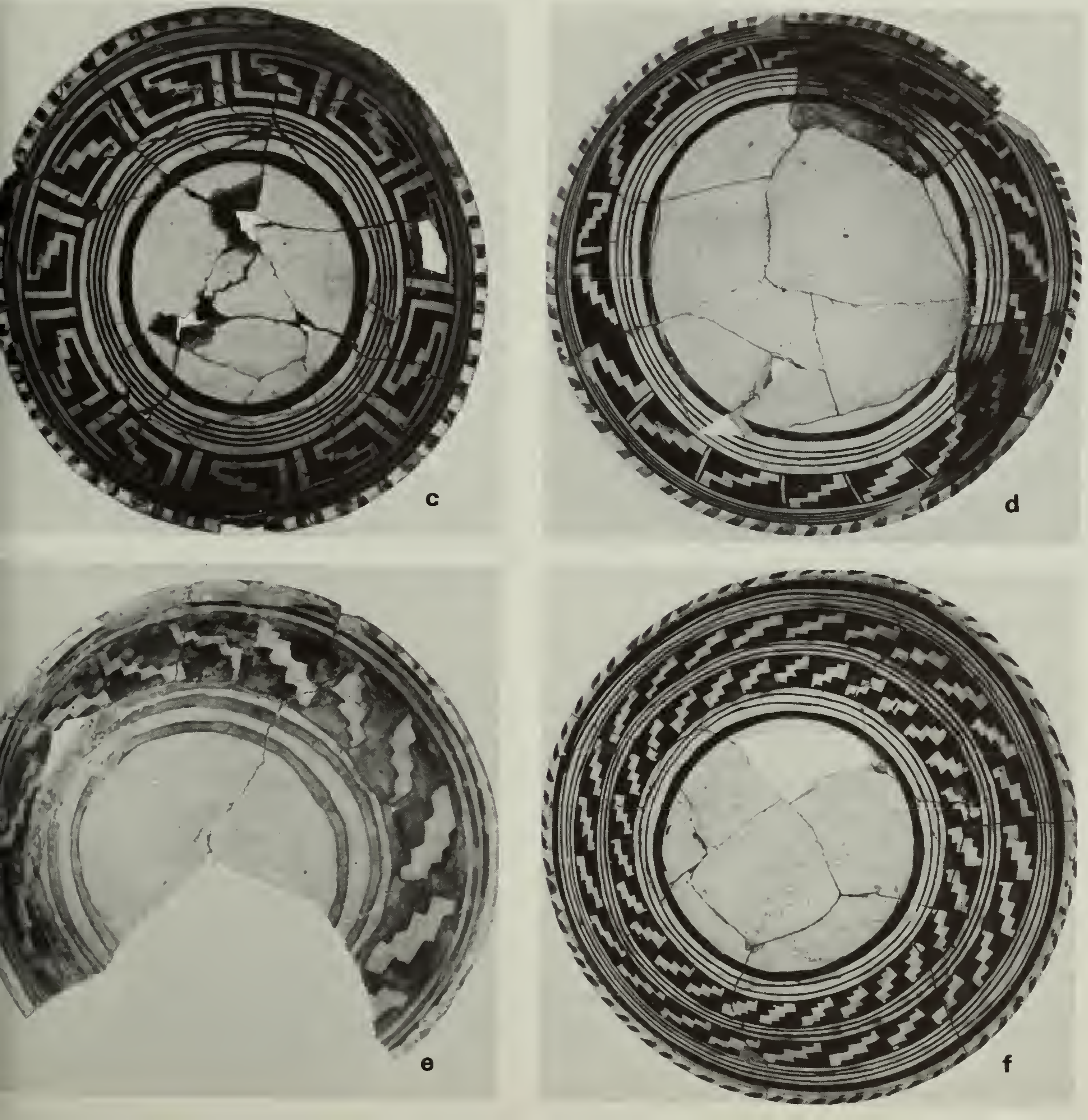
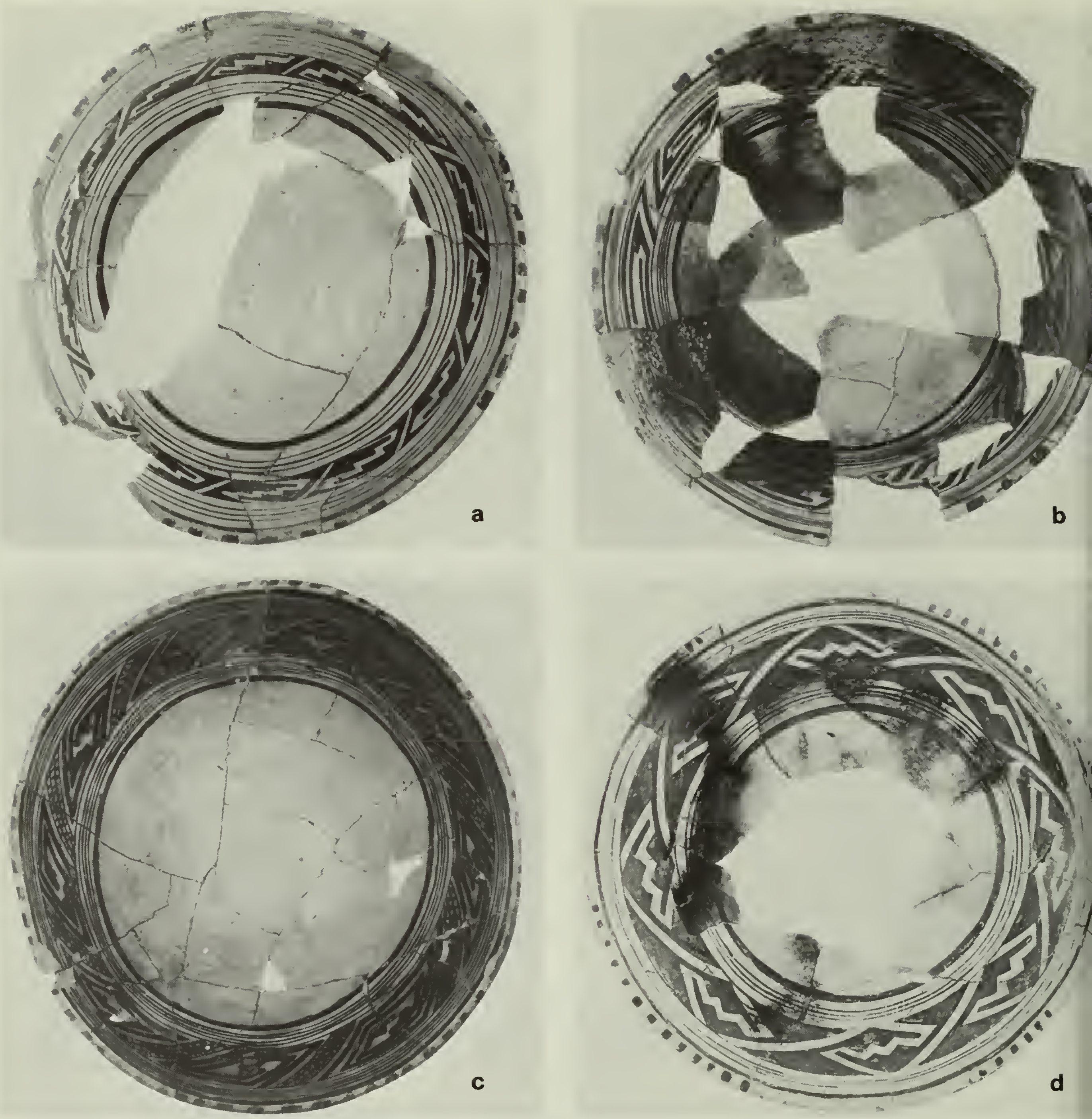
180 Opposed stepped triangle motifs on McElmo-Mesa Verde Black-on-white bowls. Numbers of examples are given in parentheses.



1 *McElmo-Mesa Verde Black-on-white bowl designs.*





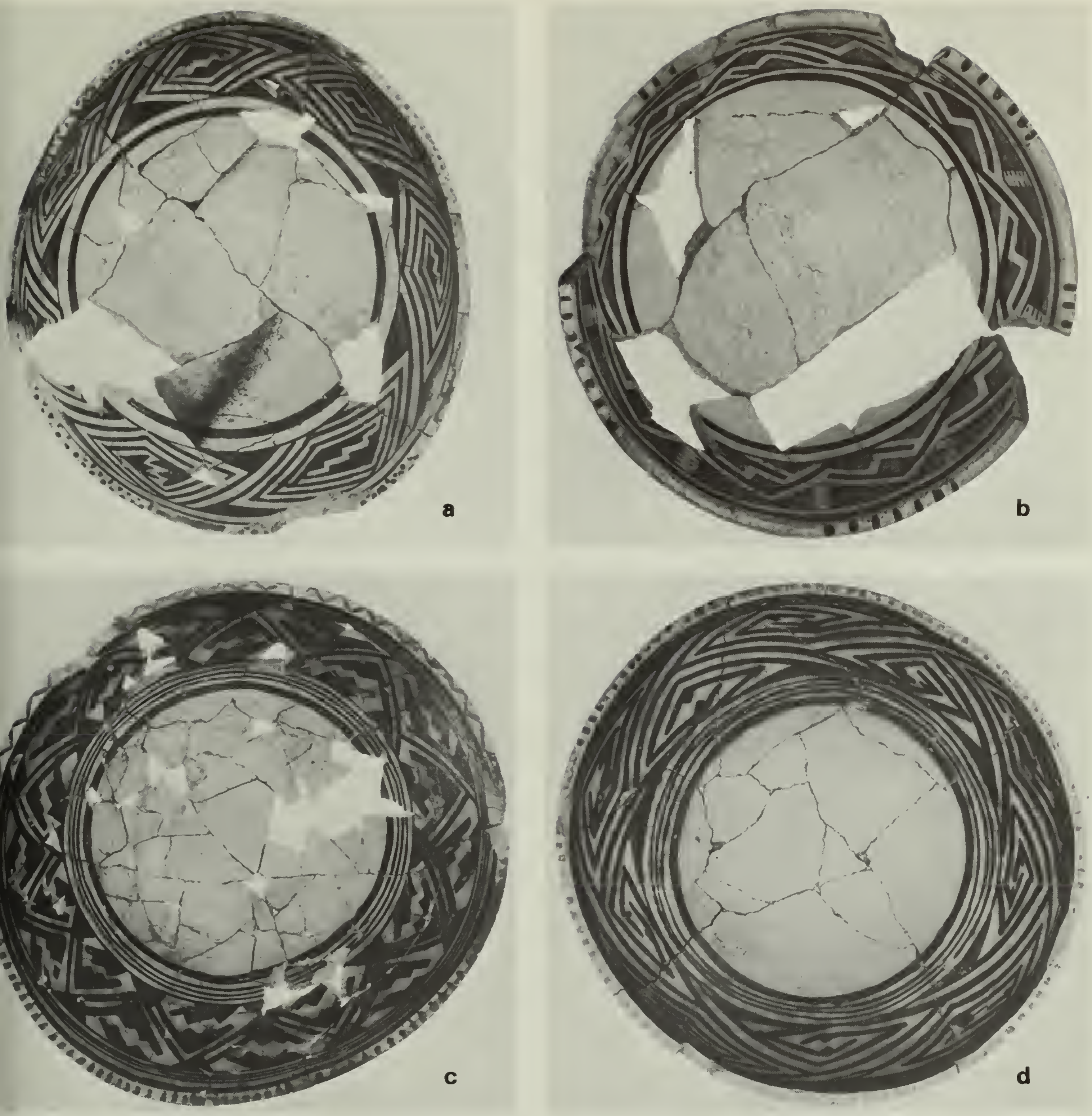
182 McElmo-Mesa Verde Black-on-white bowl designs.

175 e–h). The dots were placed in groups to form triangles and diamonds, or in columns to form oblique or curving lines. In one bowl, dots were placed in such a manner as to make a four-pointed star (fig. 175h). On three bowls, dots were painted in complete circles between pairs of parallel lines (figs. 176 b–c). On one bowl, triangular and rhomboidal spaces formed by oblique lines were filled with dots.

Parallel line band designs were applied almost exclusively on bowls of medium size. Seven of the nine larger bowls had been elaborated with dots or by alternating groups of broad and narrow lines.

By drawing parallel oblique lines across a series of horizontal lines, the artist obtained a net which could then be turned into a checkerboard by filling alternate spaces, as seen on four vessels (figs. 176d and 177b).

Parallel zigzag lines running around a bowl within the band provided the main motif on seven bowls (figs. 177c and 178 a–c). The triangular spaces formed in the angles of the zigzag were filled with solid triangles, a terraced triangle, and a triangular fret. In one case, they were left empty. A related construction places isosceles or right triangles in opposition to one another with their bases resting on the banding lines, leaving the intervening space as a negative zigzag line (figs. 177 d–e and 178 d–e). Occasionally a black line, often elaborated by alternating dots, was painted inside this elongated zigzag white space (fig. 178 f–g). Still another related design is formed



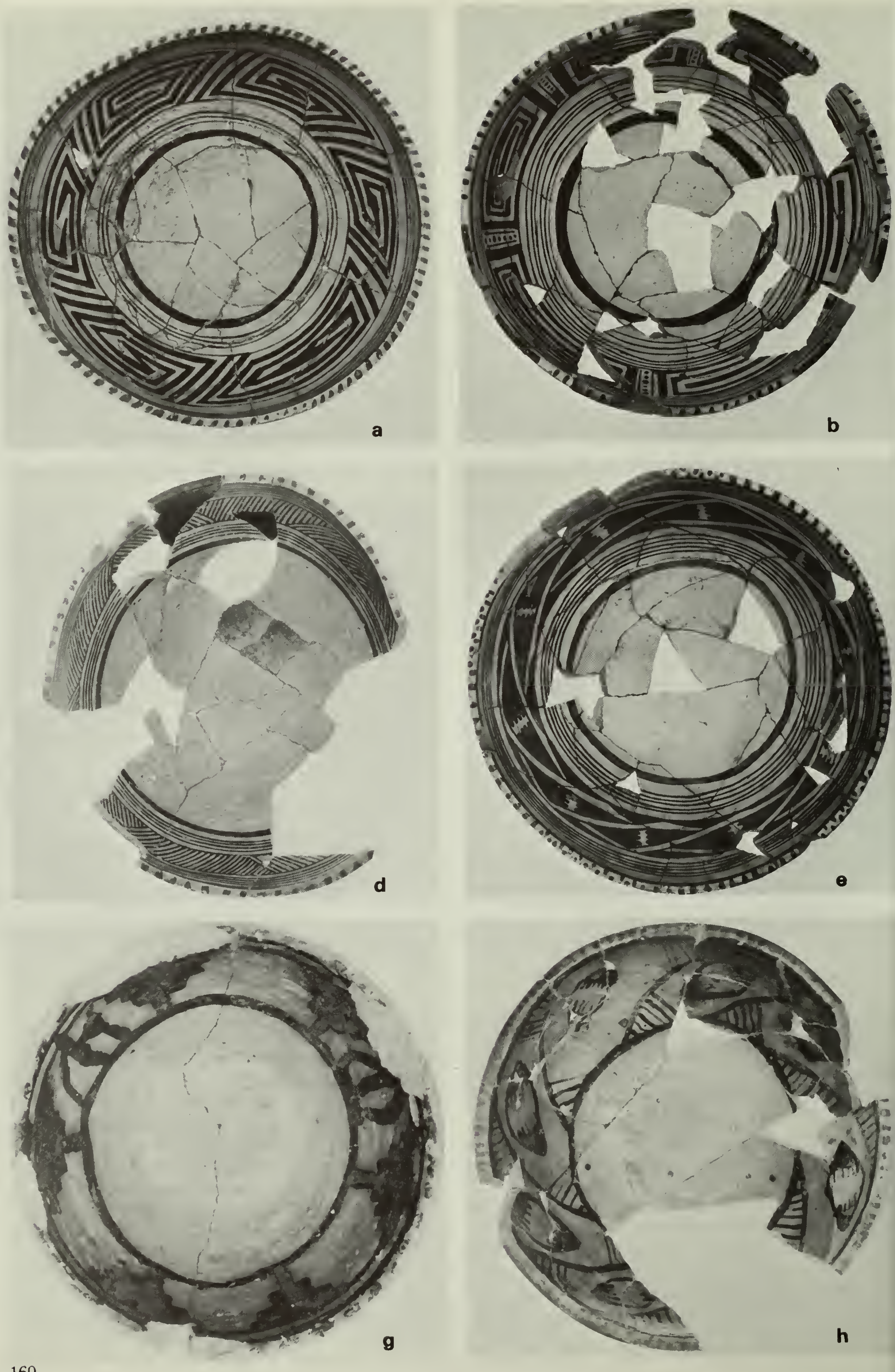
183 McElmo-Mesa Verde Black-on-white bowl designs.

by interlocking scrolls attached to the corners of right triangles whose bases lie on the banding lines (figs. 177f and 178h). A continuous curvilinear negative line results.

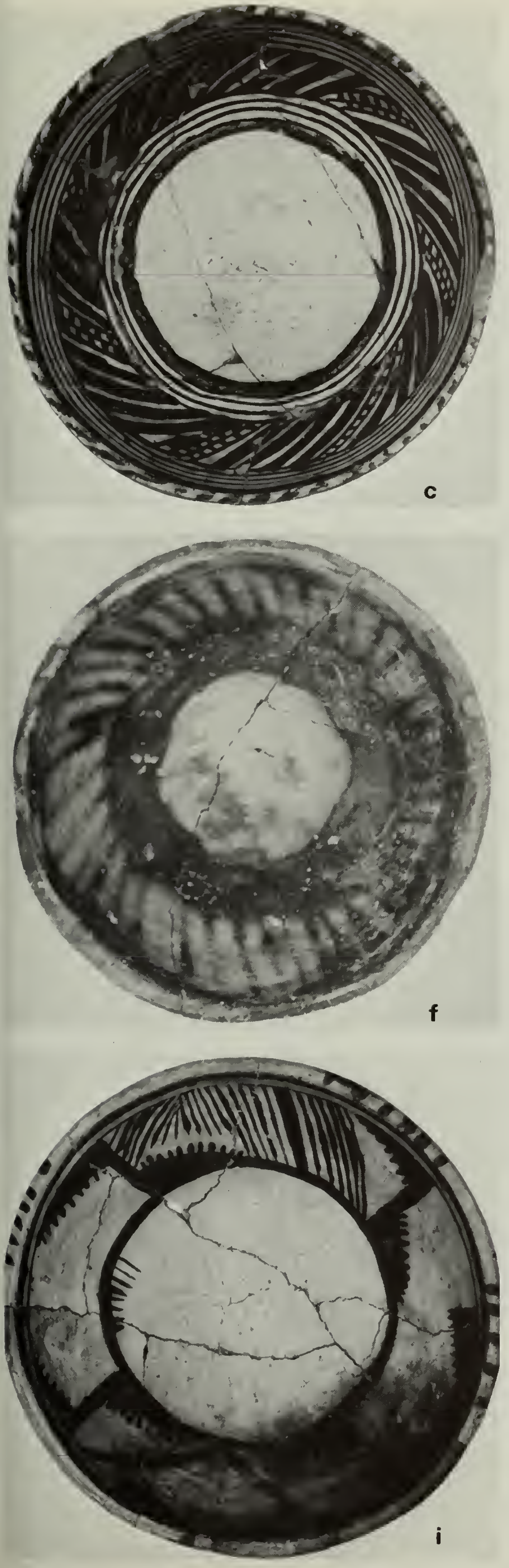
About half the bands were segmented into smaller spatial units in the course of building the overall design. In some cases, the subdividing lines were distinct from the motifs, while in others they formed part of the chief figure. Several are so thoroughly submerged in subsequent brushwork that careful scrutiny is required to pick them out. Most secondary division lines ran vertically or obliquely, but two bands were subdivided by a pair of lines zigzaging in alternating pattern (figs. 177g and 179). The resultant triangular and rhomboidal spaces were filled with solid or crosshatched figures.

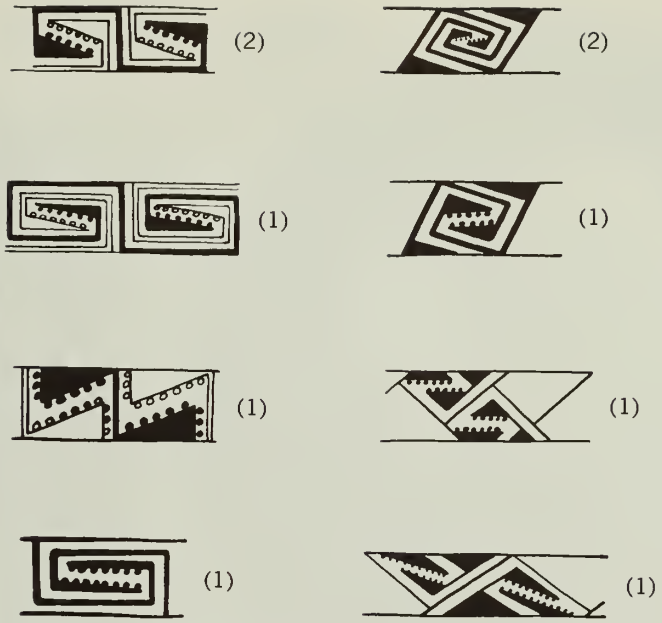
Opposed pairs of stepped triangles form the primary motif on 37 interior bowl bands. They may stand alone or be attached to short lines and frets; they may be oriented either vertically or obliquely; they may act as terminals on interlocking crooks or crooked triangles. The complete range of handling on the whole vessels can be seen in figures 180–183. Framing lines are found both above and below the band on all of these bowls.

Since each one of these bands was divided into segments before the motif could be added, it is appropriate here to examine the various ways by which this subdivision was accomplished. The easiest to recognize are those standing independent of the motif unit. Vertical or oblique lines (fig. 184a), opposed triangles whose



184 McElmo-Mesa Verde Black-on-white bowl designs.





185 Opposed ticked triangle motifs on McElmo-Mesa Verde Black-on-white bowls. Numbers of example are given in parentheses.

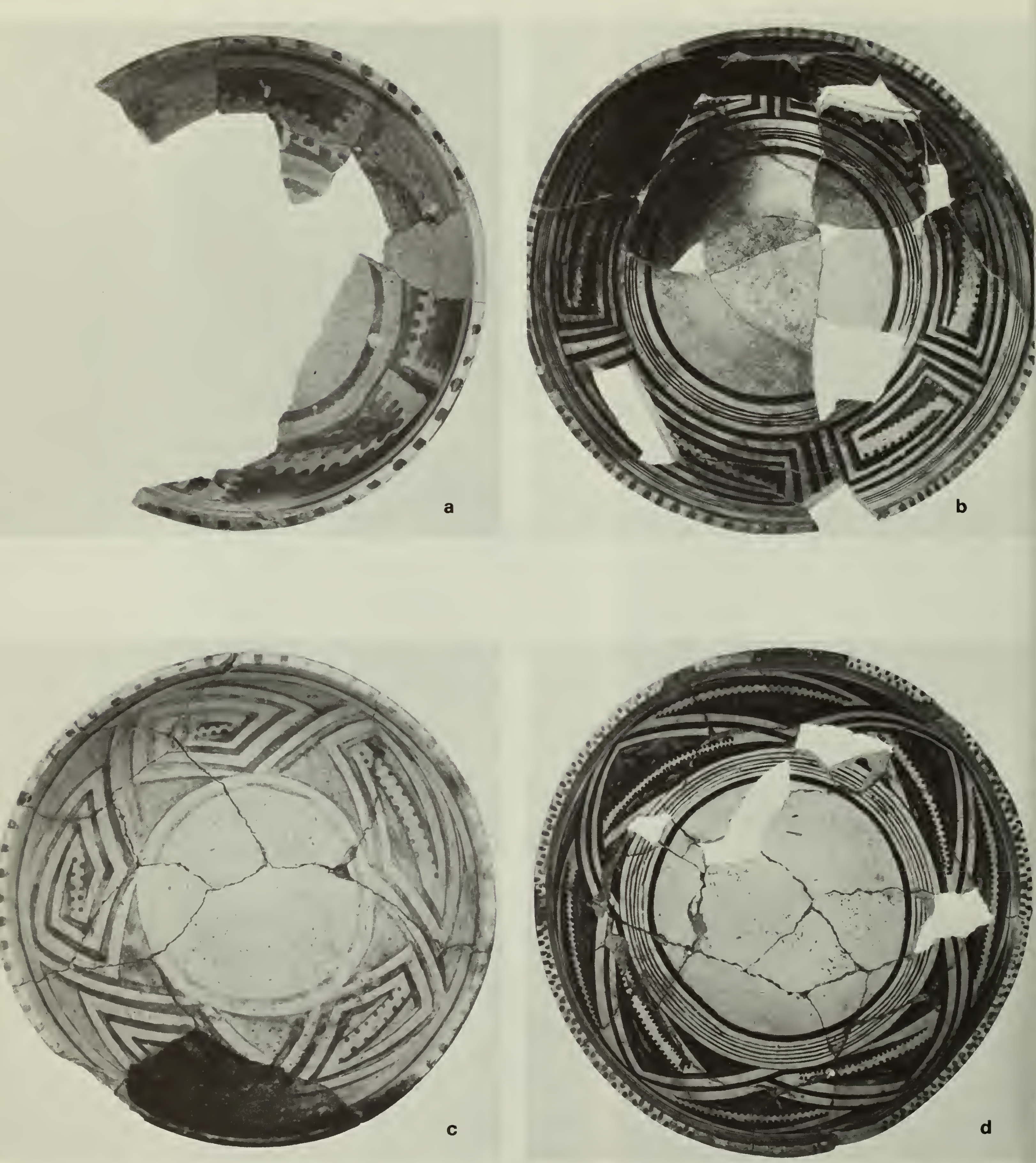
apexes are connected by a short line (fig. 184h), and panels of oblique lines and dots (fig. 184c), all served such a purpose. Most often, however, the division lines were incorporated into the design as part of horizontal S-crooks or interlocking figures. A more complex subdivision involves intersecting oblique lines running alternately from the upper and lower banding lines to form a zigzag in the center of the band (fig. 183e). The irregular spaces thus formed contained the basic motif.

Another motif, used in the same manner as the opposed stepped triangles, consists of opposed triangles with round dots pendent from the facing sides. Figures 185 and 186 show the 10 bowls bearing variations of this motif in their interior decoration.

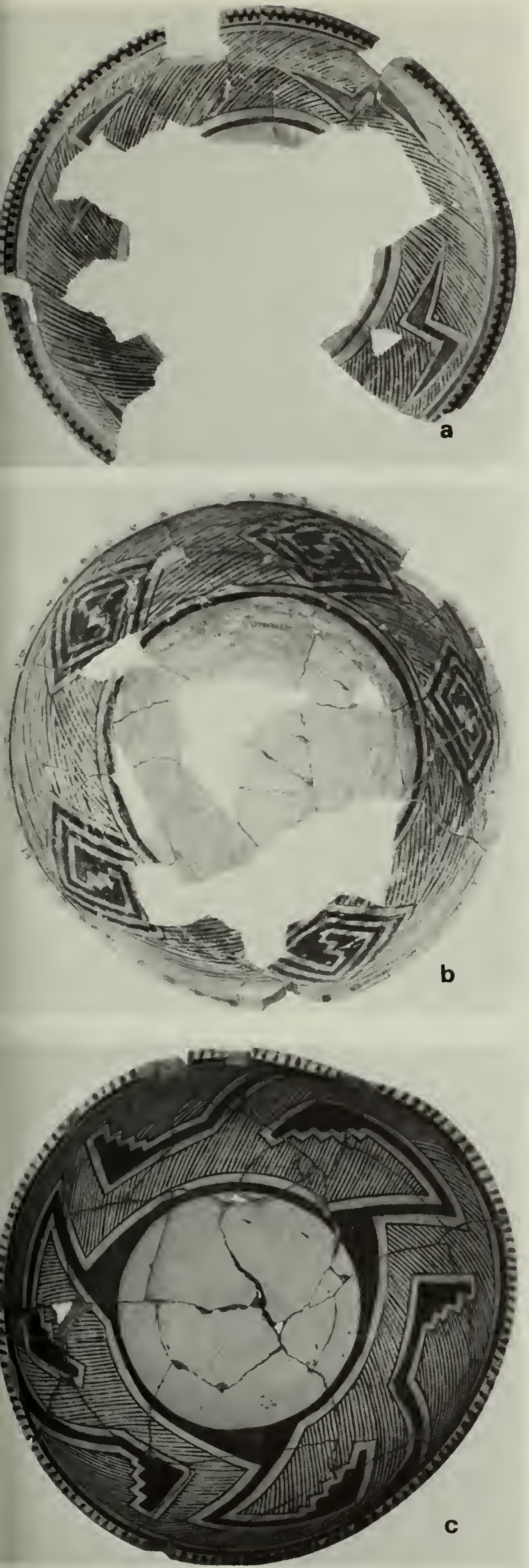
A single bowl design (fig. 177j) carried a motif of opposed double triangles on a stem.

Five bowl band designs stood out from all others in the use of straight-line hatching as a filler between the main figures or motifs, creating the effect of a halftone background (fig. 187). This approach is much more common in non-band bowl designs and on jar forms, and appears to be out of place among banded patterns on bowls. Three of the motifs are not customarily used in bowl interiors, but generally occur where cultural restrictions on decoration seem to be minimal. None of the bands are set off by more than a single, broad framing line, top and bottom.

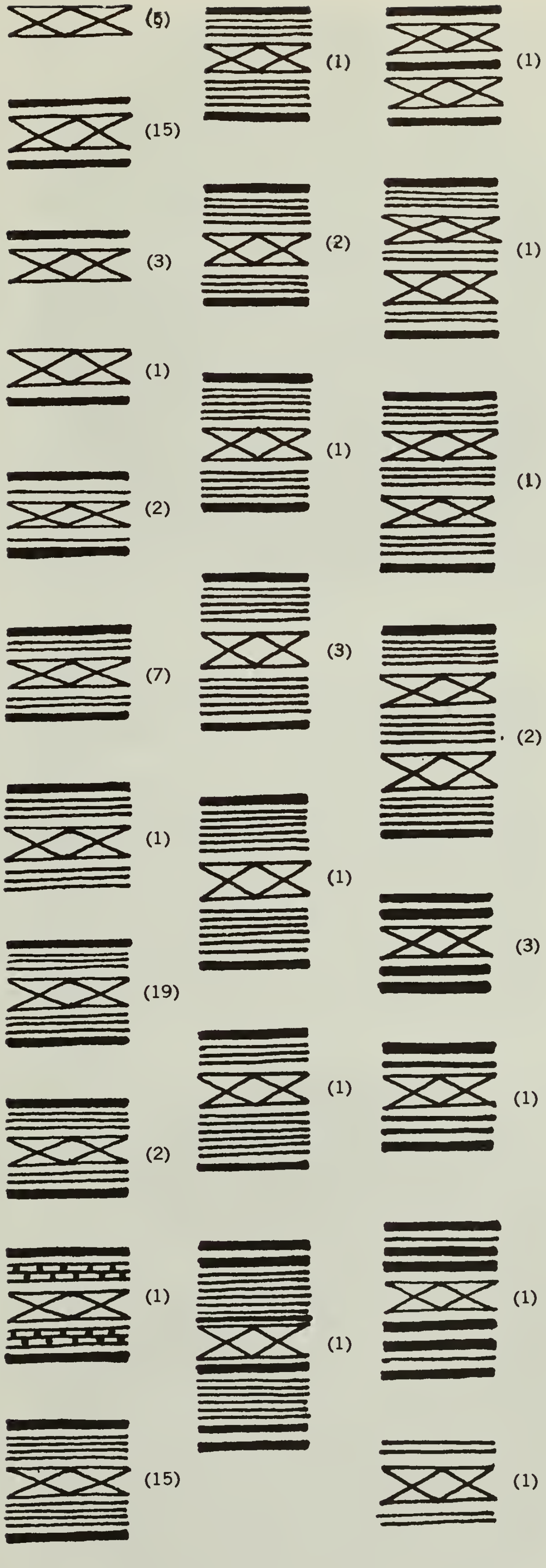
The remaining designs are represented on only one specimen each. Six of the bands are subdivided by independent dividers. The motifs carried in these segments are interlocking rhomboidal scrolls whose adjacent termini are sometimes connected (figs. 177k and 184a), concentric rectangles (figs. 177 l and 184 b), series of parallel oblique broad lines (figs. 177m and 184c), straight-line hatching running in different directions (figs. 177n and 184d), solid ovoids with dotted space



186 McElmo-Mesa Verde Black-on-white bowl designs: opposed triangles with pendent dots.



187 *McElmo-Mesa Verde Black-on-white bowl designs.*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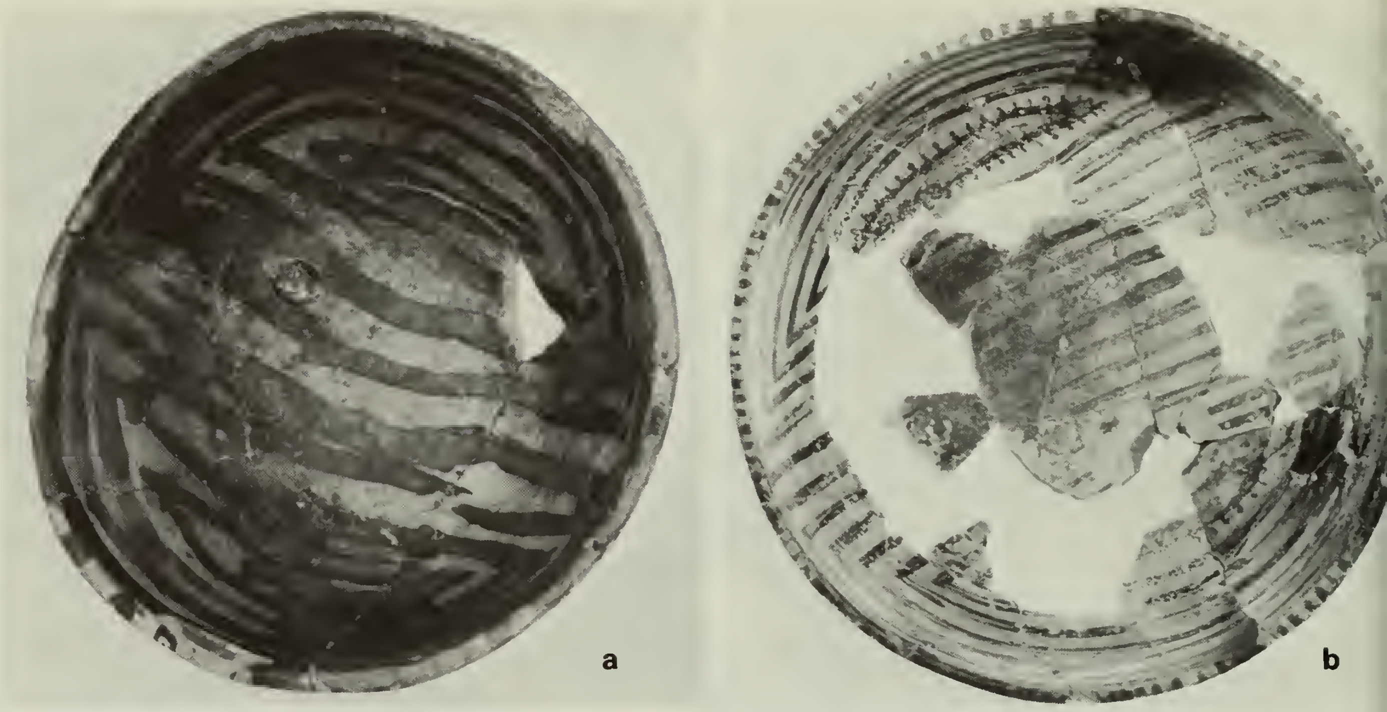
188 *Various combinations of framing lines for band designs on McElmo-Mesa Verde Black-on-white bowls. Numbers of examples are given in parentheses.*



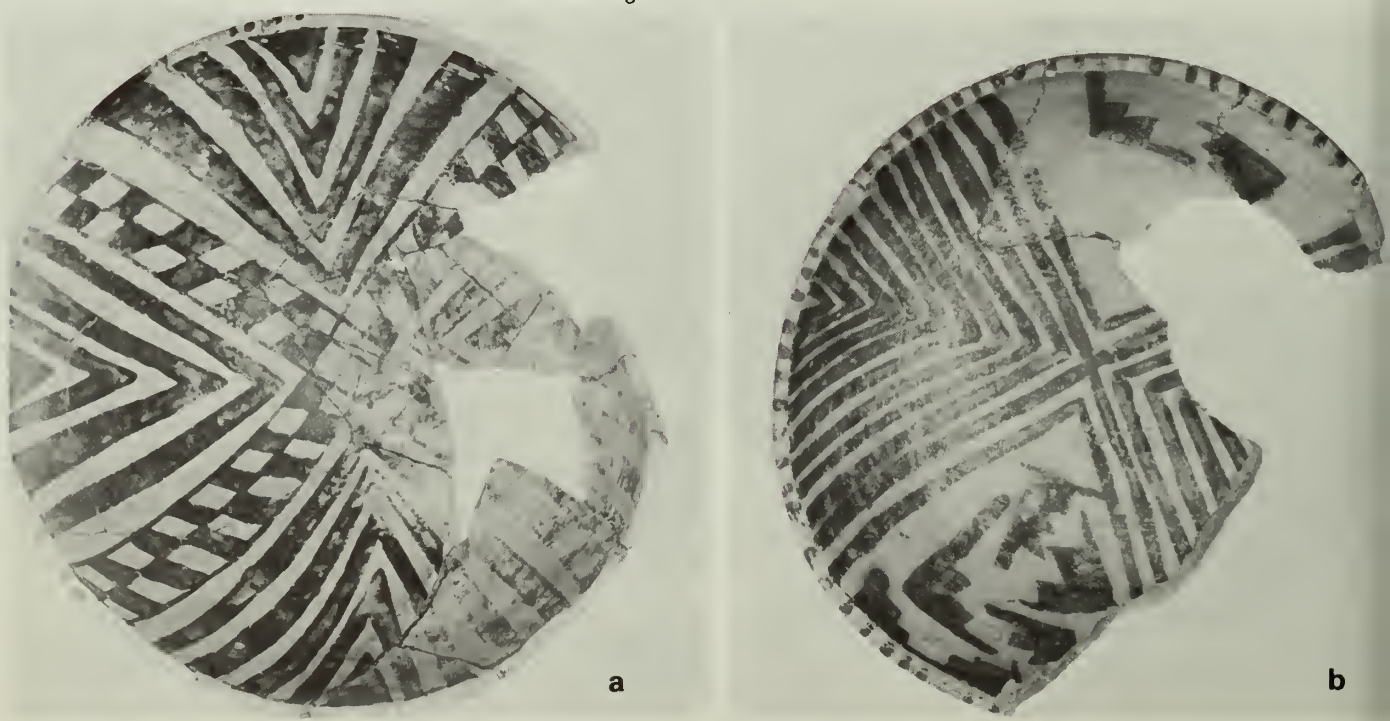
189 McElmo-Mesa Verde Black-on-white bowls: non-band designs.

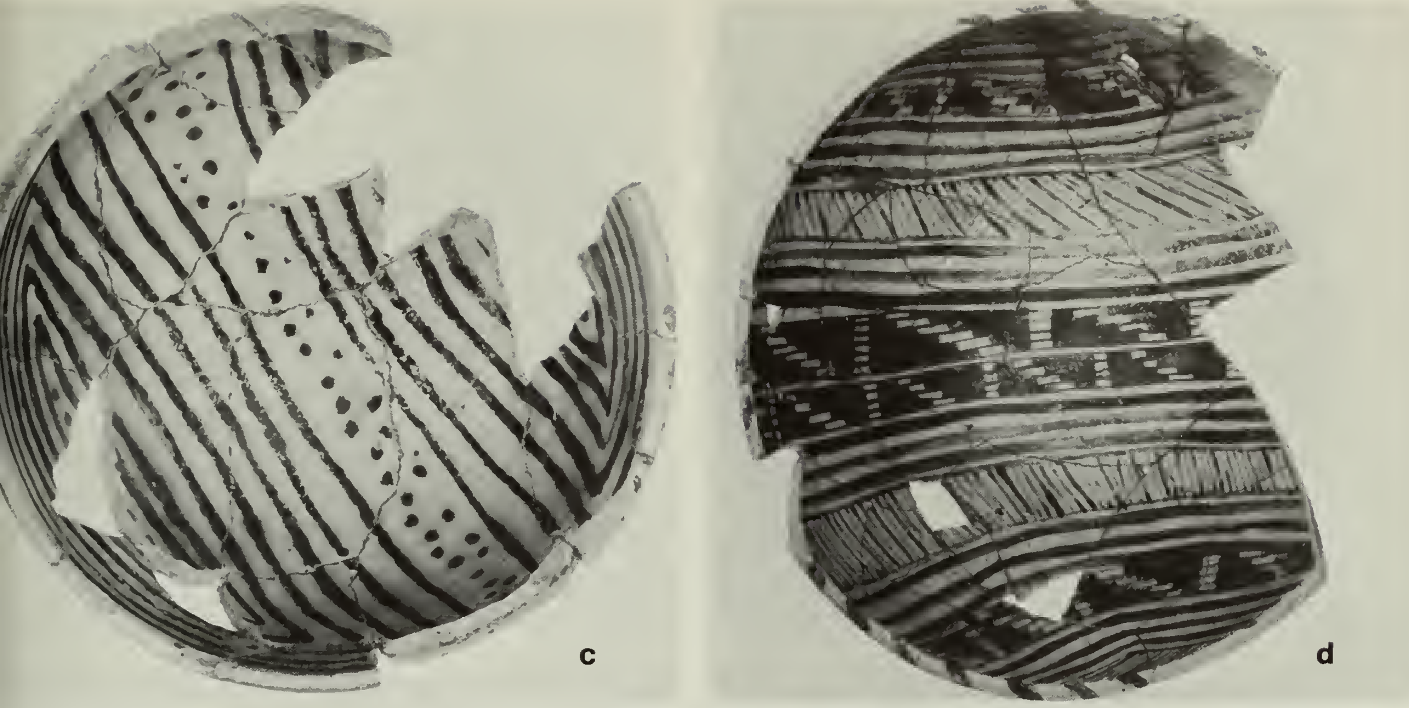
breakers (figs. 177t and 184h), and miscellaneous lines and triangles (figs. 177p and 184i). Two other designs emphasize unpainted areas in a form of negative design (figs. 177o and 184e).

One band is completely filled with crosshatching over which several lines have been superimposed (fig. 177g). Other bands consist of oblique parallel lines (figs. 177r and 184f), inverted terraced triangles (figs. 177s and 184g), and large round dots between vertical lines (fig. 177u).

It was a typical practice for Mug House potters to frame band designs with various combinations of parallel lines closely similar to the parallel-line band designs. With the exception already noted for hatched background patterns, greater or lesser elaboration of these framing lines does not appear to correlate with particular motifs. The various combinations of framing lines found on bowl interior band designs are shown in figure 188, with an indication of their relative popularity. Symmetry was followed in all but 14 (16 percent) of the 87 bands to which framing lines were added. Two-thirds of these combinations involved one broad line at top and bottom, each separated from the band proper by two to five narrow lines. The most complex frame was a series of two broad lines, six narrow, and one broad both above and below the band. The simplest consisted of a single broad line either above or below. The 49 bands without

190 McElmo-Mesa Verde Black-on-white bowls: non-band designs.

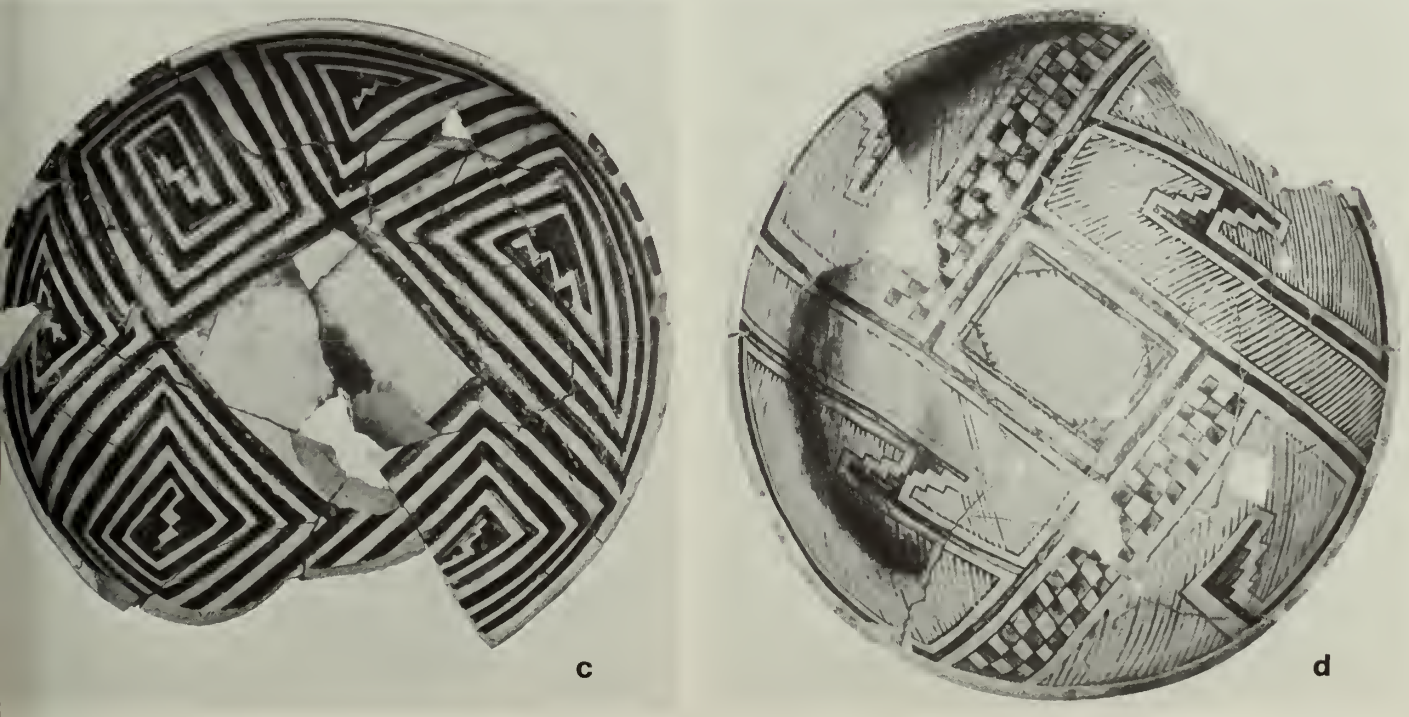


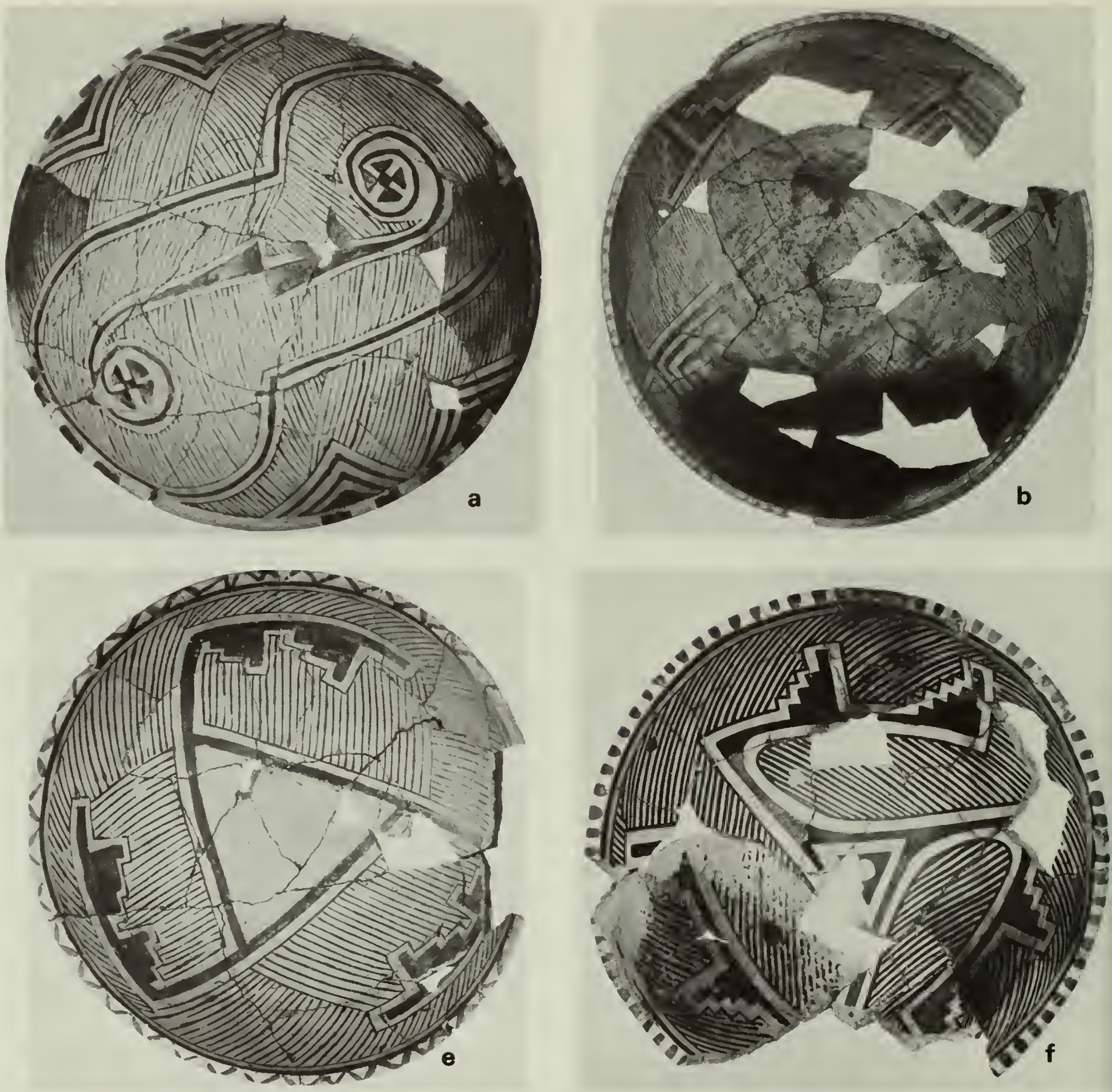


framing lines included all 44 parallel line designs but only 5 bands containing other motifs. Elaborate frames tended to appear only on Mesa Verde Black-on-white bowls, whereas McElmo Black-on-white bands were most often simply framed. There were five double bands.

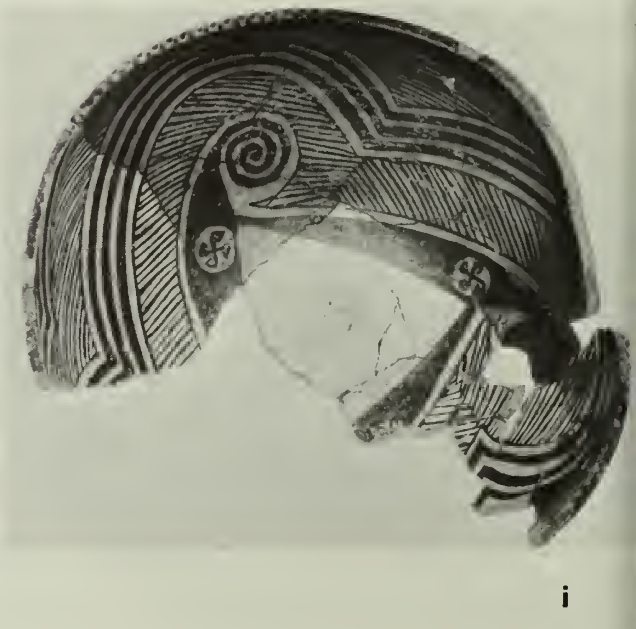
Non-band designs on the interiors of bowls can be divided into two categories. Centered and Offset Trisected layouts carry bold, solid figures set in a hatched background, while all other sectored layouts bear bold, solid figures on a plain white background. Four Halved layouts are decorated with mirrored sets of concentric broad line D's (fig. 189a–c); two are elaborated by the use of dots. Another Halved pattern employs successive panels of typical band designs. Still another design pattern (fig. 189d) alternates panels of diagonal hatching, broad parallel lines, and the so-called "mosquito bar" motif, so common on the late black-on-white pottery types of northeastern Arizona.

The two Quartered designs are built of solid triangles, broad-line chevrons, checkerboard, and opposed stepped triangles (fig. 190a–b). Broad line triangular and rectangular scrolls or involuted lines ending in dotted or stepped triangles fill the subdivisions of two of the Offset Quartered designs (fig. 190c). The third vessel with an Offset Quartered layout provides the only exception to the layout-design correlation mentioned above. Stylis-





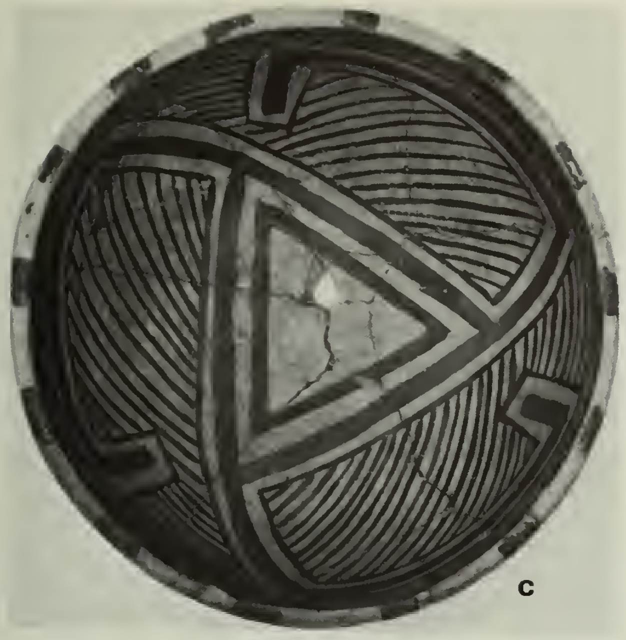
191 McElmo-Mesa Verde Black-on-white bowls: centered designs.



tically, it belongs with the Centered layouts (fig. 190d).

Centered designs were constructed on lines, open triangles, or rectangles drawn in the center of the bowl (fig. 191). The sides of these figures were then extended at the corners, always in one direction, and the lines curved or bent into curvilinear or rectilinear hooks or scrolls, producing a pinwheel effect. Broad curving lines outlined four of the five curvilinear figures. Large open spaces often contained individual solid figures such as a cross formed by one square and four triangles, a triangular scroll, either solid or crosshatched triangles, broad line chevrons, and stepped triangles. The radiating lines themselves ended in stepped or plain triangles. All the remaining spaces were finally filled in with straight-line hatching, which gave the effect of a halftone background.

The same treatment—solid black figures against a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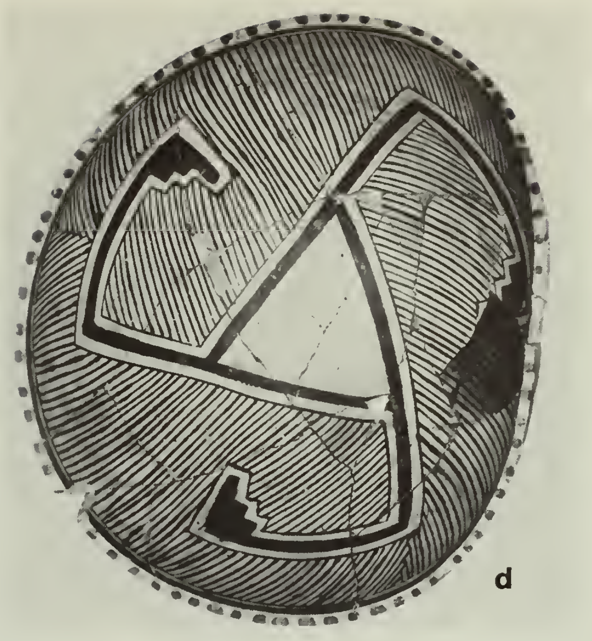
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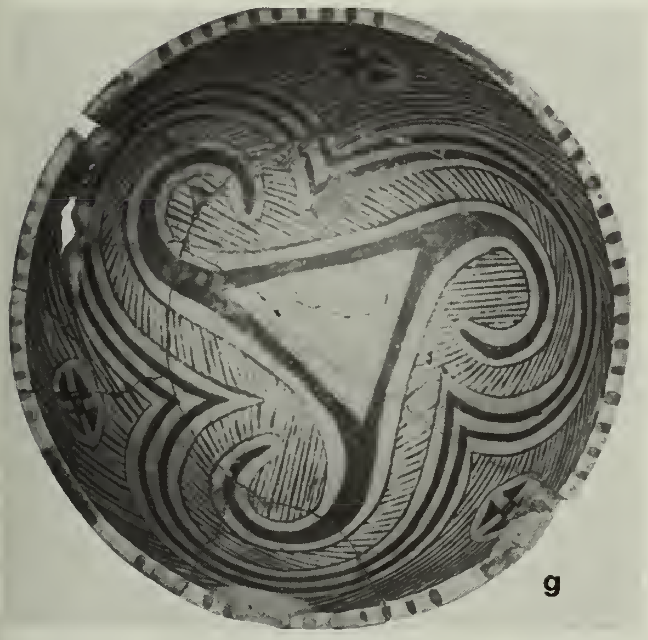
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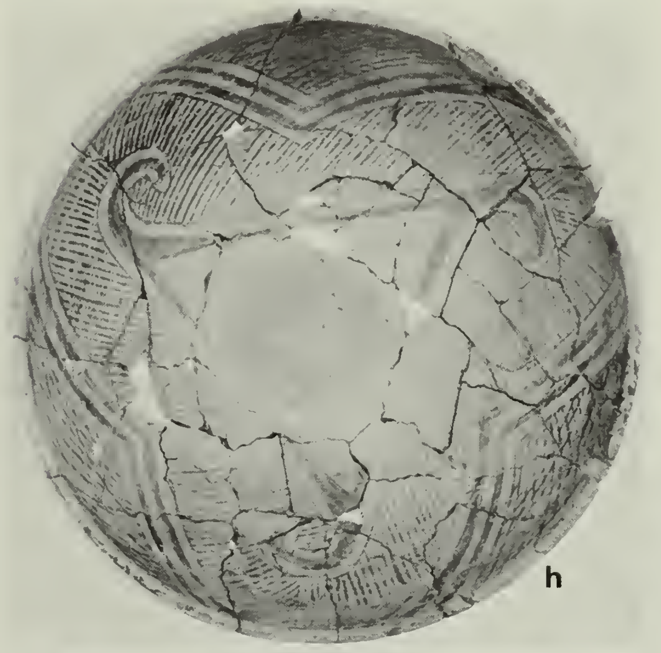
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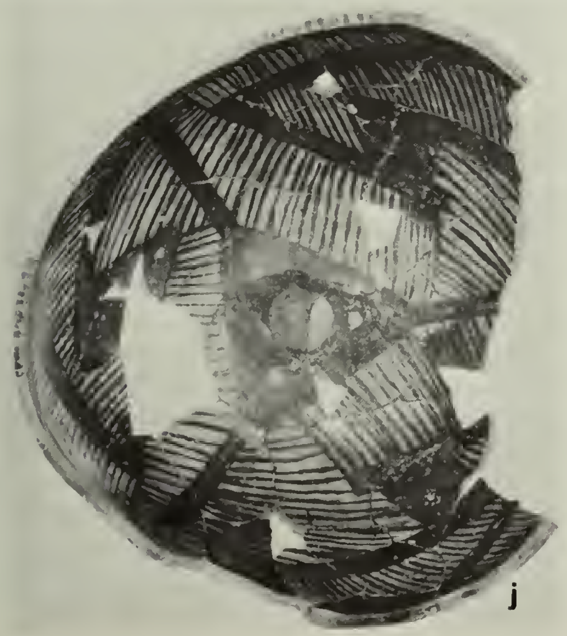
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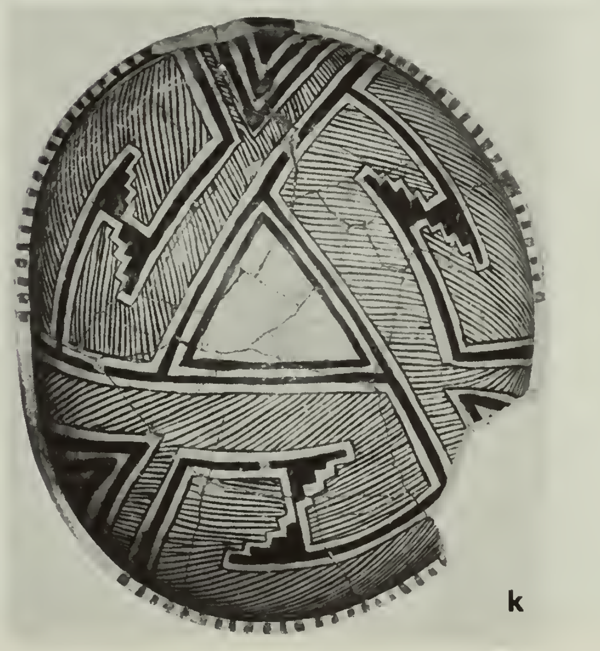
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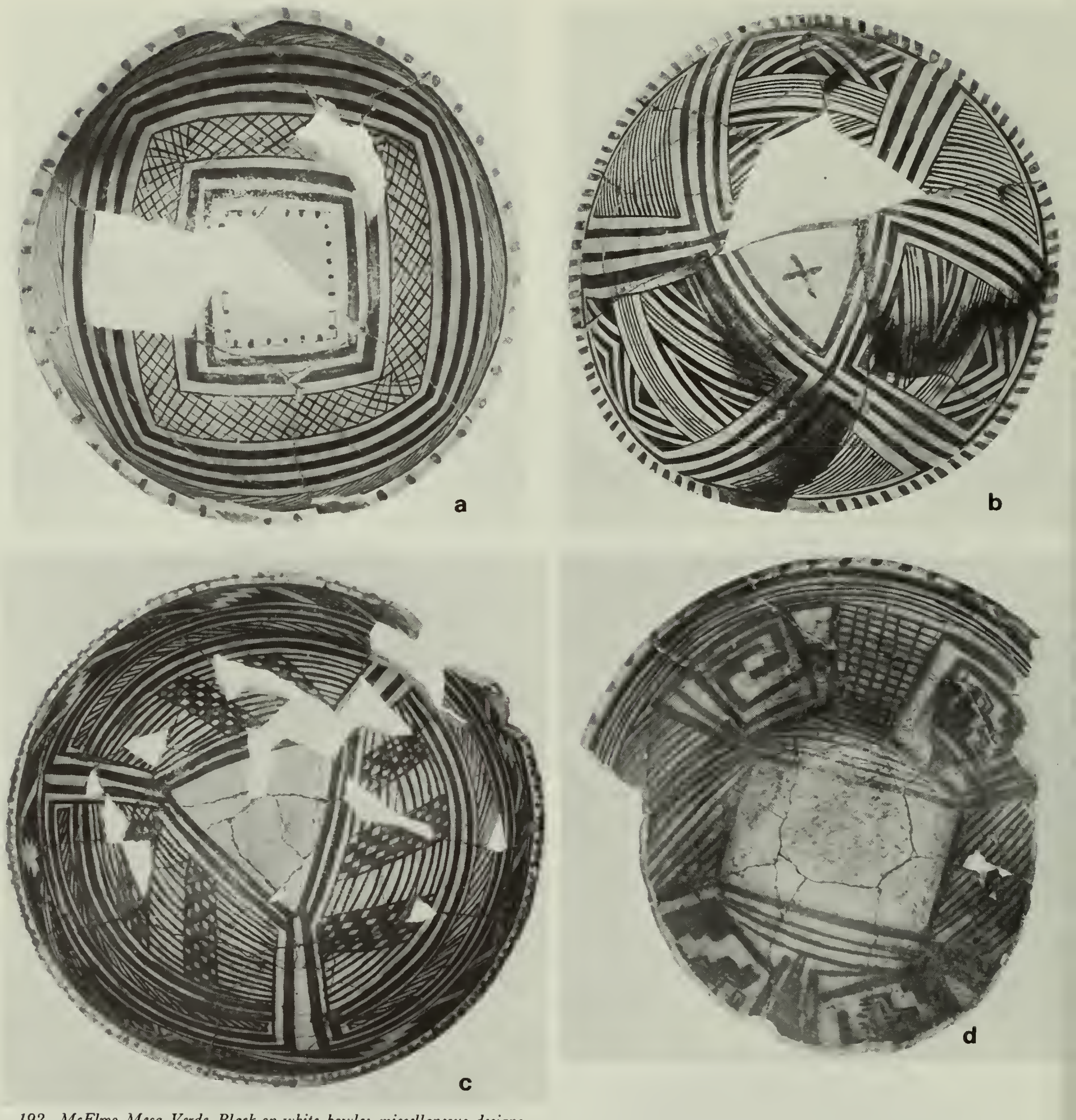
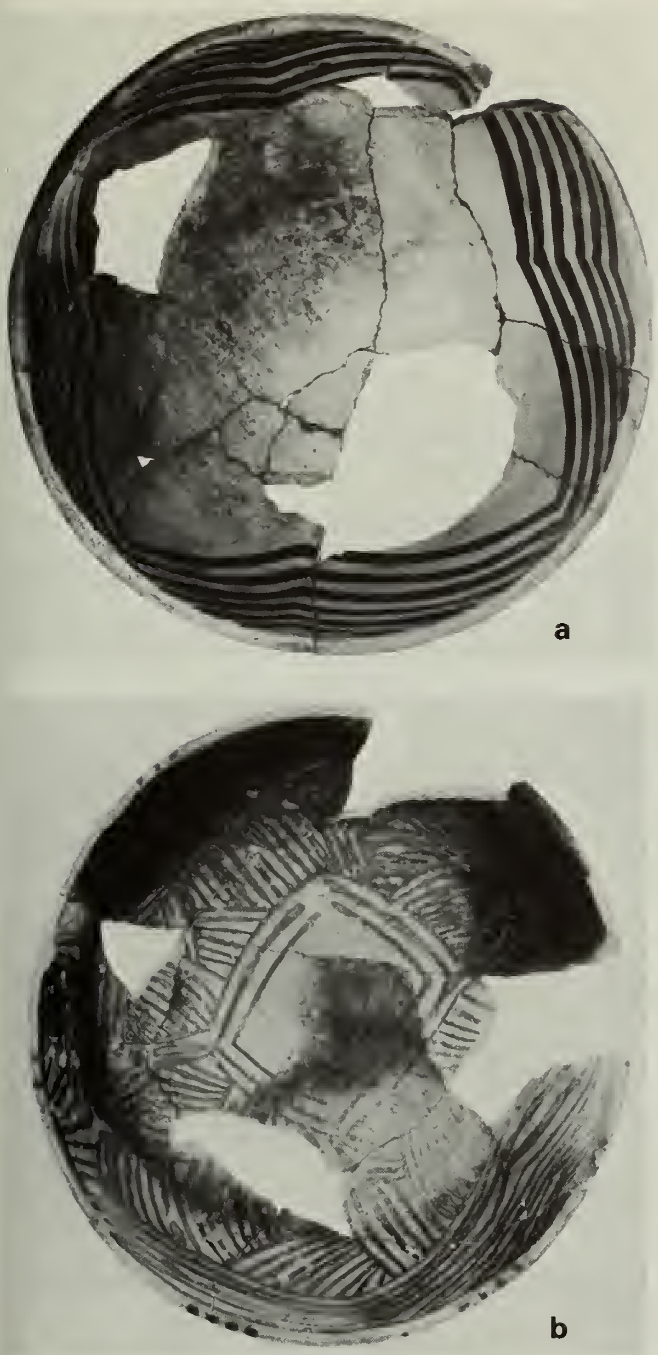


192 McElmo-Mesa Verde Black-on-white bowls: miscellaneous designs.

hatched background—was applied to the three bowls with an Offset Trisected layout (fig. 191k) and to one with an Offset Quartered layout. In all but one of the designs of this style, the hatching does not touch the solid figures but is separated from them by a narrow band of white. The lone exception is also the only vessel classified as McElmo Black-on-white (fig. 191j). The total effect of solid figures on hatched background superficially resembles the widespread Reserve-Tularosa design style in which interlocking solid and hatched figures lie in nearly perfect balance. The difference between this style and the Mug House vessels lies in the use of hatching in the latter case as a background tone rather than as a coloring of one or two figures of which the motif is constructed. Both of these applications of solid and hatched units of space, however, may be seen on vessels of Classic Mimbres Black-on-white from the Mimbres Valley in southwestern New Mexico (Bradfield, 1931; Cosgrove and Cosgrove, 1932).

Solid and hatched patterns occur on 23 bowl interiors (14 percent). Hatching was employed on 28 bowls (17 percent).

Four designs are difficult to place with any of the preceding groups. Figure 192a is essentially a four-part Centered layout consisting of concentric rectangles formed by broad lines or by narrow panels of hatching. Figure 192b is divided into six parts by the same initial layout of Offset Trisection. The three triangular spaces have been filled with straight-line hatching paralleling one side, while the alternating trapezoidal spaces each contain three horizontal panels of linear figures commonly found in band patterns. The bowl shown in figure 192c



193 McElmo-Mesa Verde Black-on-white bowls: unusual design patterns.

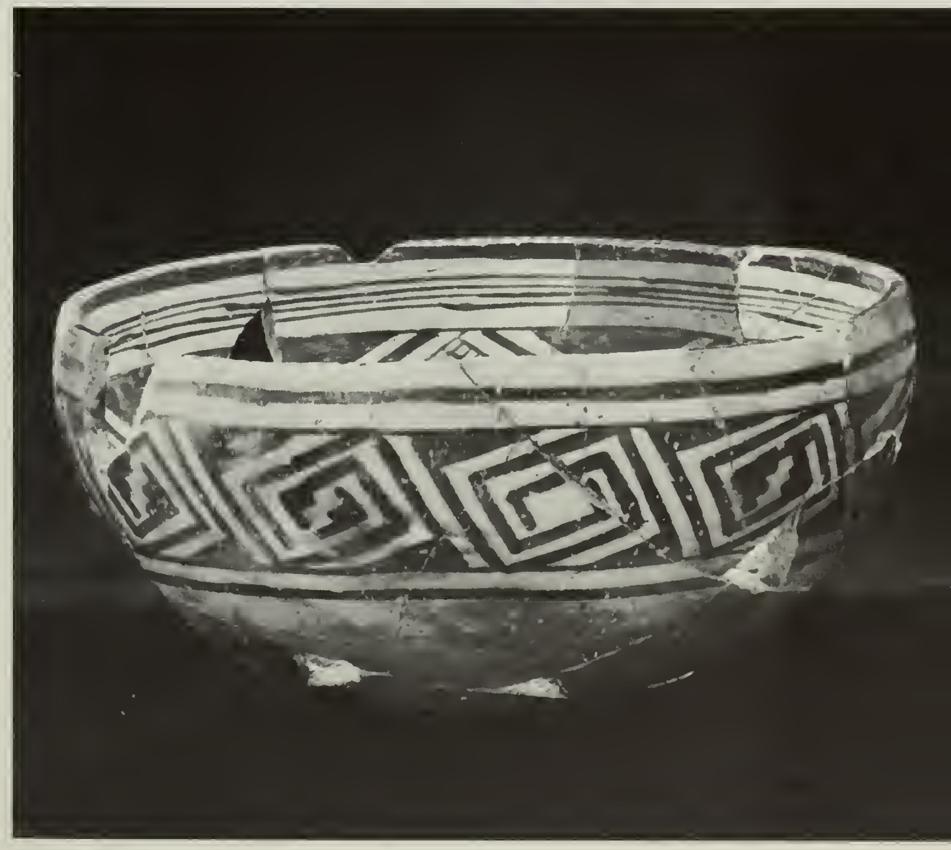
has a narrow band just below the rim and a trisected field in the center. Opposed stepped triangles occupy segments of the band which are separated by oblique panels of lines and dots. The three central spaces hold horizontal panels of hatching and linear patterns. Figure 192d illustrates a bowl with a band of parallel lines adjacent to the rim and a central field divided into four sections. Two opposing sectors are filled by straight-line hatching. The other two are further subdivided into three segments each and contain figures common in simple band designs, although different figures are used on opposite sides.

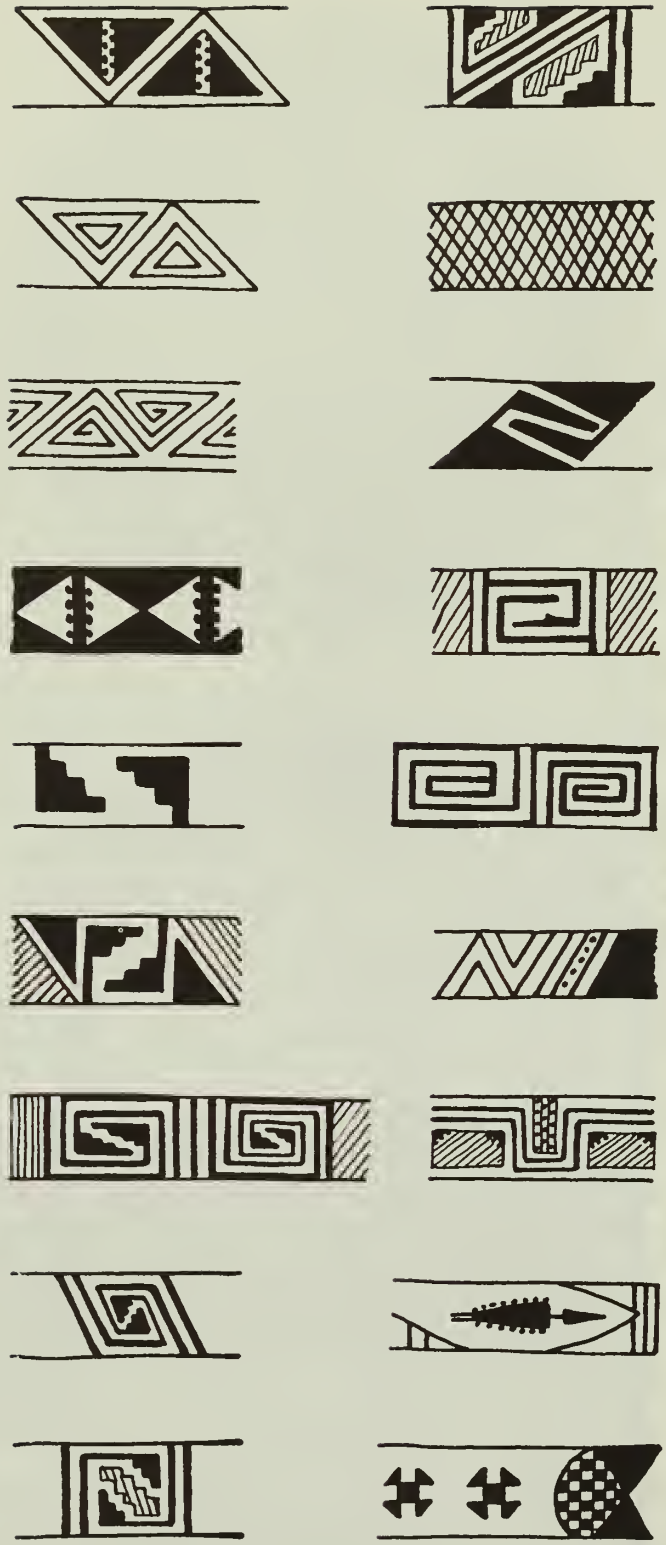
Two patterns do not fit any of the generalizations already made about bowl decoration. One simply bears four sets of concentric chevrons pendent from the rim. When viewed from directly above (fig. 193a), these chevrons are seen to outline a negative four-pointed star. The second design was drawn between a circular line just below the rim and three concentric rectangles in the center. Instead of a typical formal motif, however, this space was first subdivided by a number of irregular meandering lines and then the odd-shaped spaces thus formed were filled with irregular meandering lines (fig. 193b). These vessels may represent some individual's experimentations that did not become a part of the McElmo-Mesa Verde Black-on-white style.

The exteriors of 127 bowls (75 percent) also bore decoration. Band designs of the sort we might expect to see on bowl interiors occurred on the exteriors of 39 vessels (23 percent). One pattern was essentially 4-part Centered: nine consisted of from 1 to 4 broad parallel lines, with one case of 10 narrow parallel lines in the manner so common in the parallel-line band motif. All other forms of decoration do not fit the stereotype followed on bowl interiors. Forty-seven carried isolated figures, some of which are biomorphic; there are 10 frets, 7 sets of parallel zigzag lines, and 6 meandering lines. The remaining seven pots had combinations of lines with pendent figures, enclosed figures, and one case of isosceles triangles pendent from the rim.

Few of the exterior band designs mirrored those found on bowl interiors, but the same or similar motifs were consistently used (figs. 173d and 194). Five had parallel zigzag lines within a band (fig. 196a); one had an oblique checkerboard (fig. 196b). Isosceles triangles drawn with slide reflection symmetry (Shepard, 1948) made up three bands (fig. 195a–b). A similar effect was

194 Mesa Verde Black-on-white bowl with similar interior and exterior band designs.



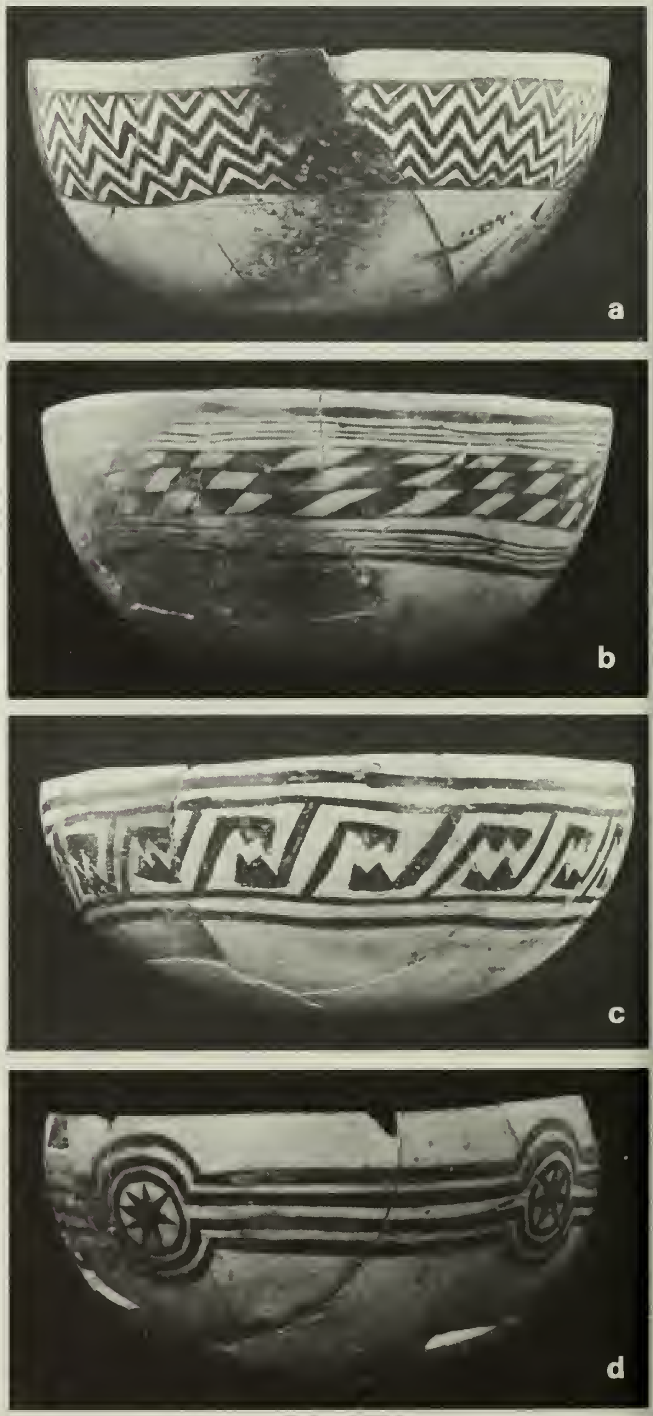


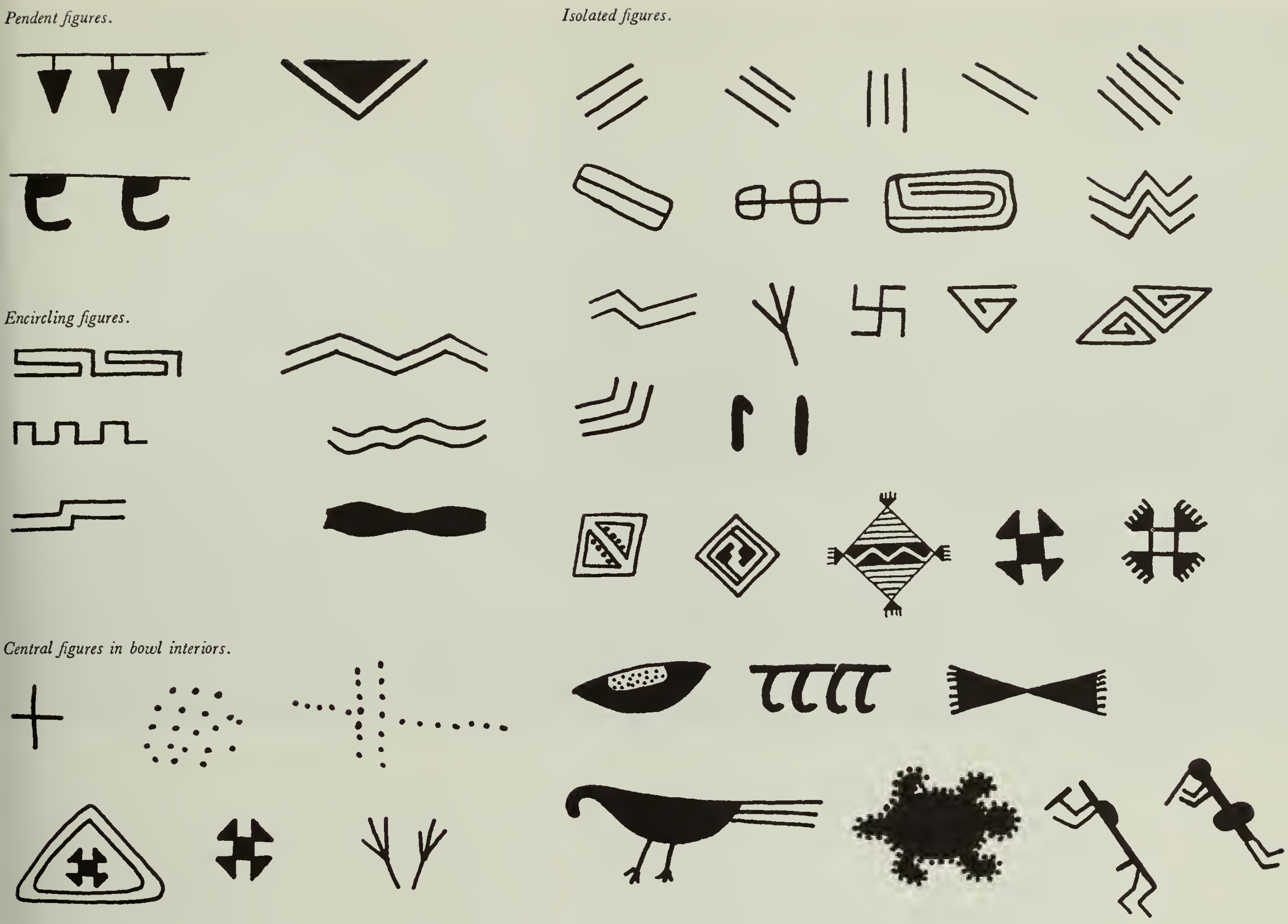
195 Band designs on exteriors of McElmo-Mesa Verde Black-on-white bowls.

achieved by a repeated series of double triangular scrolls (fig. 195c). There were additional variations on the theme of repeated rhomboids (fig. 195d). Other motifs employed in various patterns are: opposed stepped triangles (figs. 173d, 194, and 195e–j), interlocking rhomboidal scrolls (fig. 177k), negative Z-twist, opposed double triangles, unembellished crosshatching (fig. 195k) repeated oblique lines, interlocking hooked triangles (fig. 195l), interlocking crooks (fig. 195m), and double rectangular scrolls (fig. 195n). Familiar figures appeared in unusual combinations (fig. 195o–p). However, biomorphic figures (fig. 195q) and the square with external corner triangles (fig. 195r) were not used in bands on bowl interiors.

Other encircling figures include meanders and frets (figs. 173a, e, and 197). A few figures are pendent from horizontal and zigzag lines, or from the rim. Isolated figures are placed asymmetrically or in balanced sets of two, three, four, five, and six. Figure 197 illustrates the complete range of non-band decorative figures found on the exteriors or in the bottom interiors of the Mug House bowls. Obviously, the potters exercised a great deal more freedom of expression when decorating these fields than when painting interiors.

196 Designs on exteriors of McElmo-Mesa Verde Black-on-white bowls.



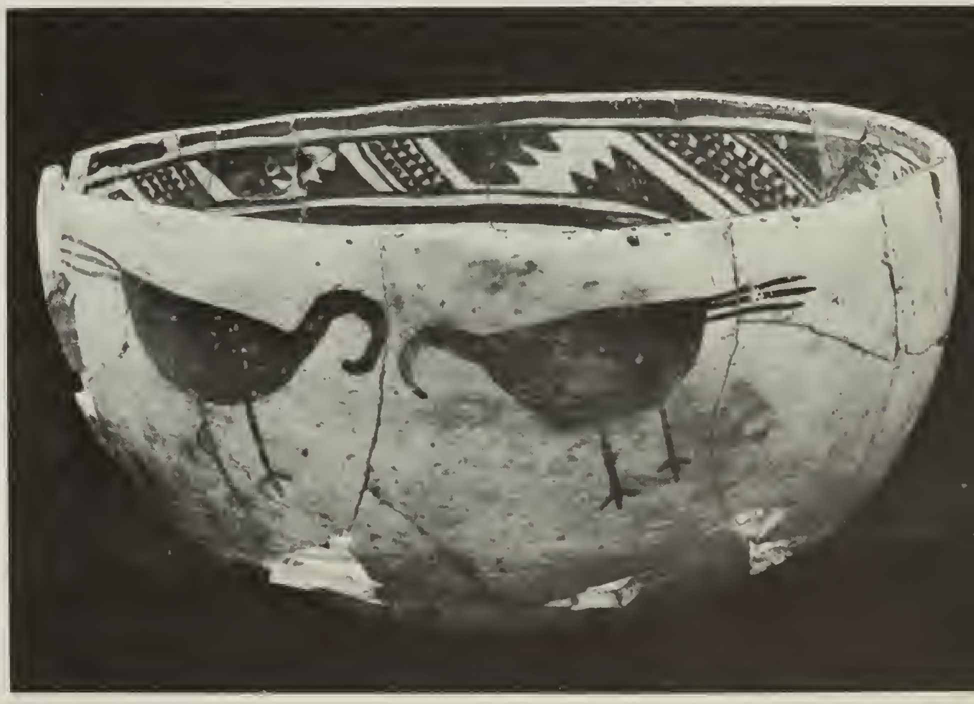

Pendent figures.
Isolated figures.
Encircling figures.
Central figures in bowl interiors.

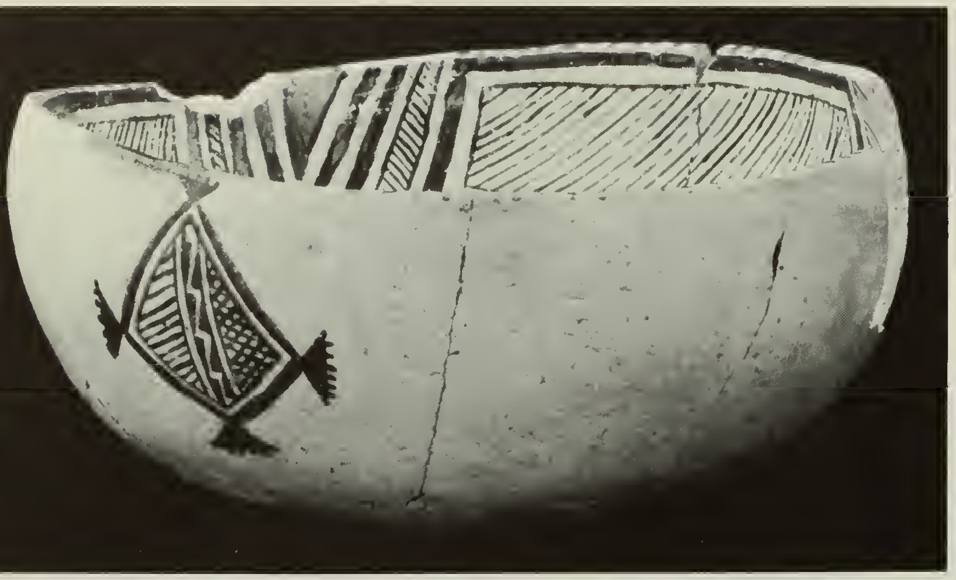
197 *Designs on exterior and interior bottoms of McElmo-Mesa Verde Black-on-white bowls.*

Very few of these exterior figures appeared in the standard interior designs. Triangular scrolls and S-scrolls, pendent isosceles triangles, and opposed stepped triangles within concentric rectangles were all employed within band segments or as aids in building up band designs. They occurred as isolated units, however, only on bowl exteriors where the design style limitations were less rigid. Talons, swastikas, and squares with external corner triangles were placed in relatively open interior spaces not occupied by the design motif or inside the larger space breakers within solid units. Talons were twice employed as the solid figure surrounded by hatching (once on a bowl exterior).

Biomorphic figures appeared on 10 bowl exteriors. Four, five, or six birds, often in facing pairs (fig. 198), were painted on six exteriors, bird tracks on two, a small animal resembling a horned lizard on one, and a group of at least four forms in the attitude of the humpbacked flute player on another. If Hawley's (1937) identification of the flute player with the Hopi kachina Kokopelli is correct, it is possible that the two different forms shown on this bowl represent male and female figures (Fewkes, 1903; Parsons, 1938).

198 *Mesa Verde Black-on-white bowl with facing birds on exterior.*





199 Mesa Verde Black-on-white bowl with related designs on exterior and interior.

Several interesting correlations surround bowl exterior decoration. Only half of the McElmo Black-on-white bowl exteriors were decorated, predominantly with isolated figures and some lines. Only two were banded. There were no frets. Only 2 of the 44 parallel-line band design bowls carried bands on their exteriors, too. External banding did occur in equal proportions on bowls with other kinds of interior bands and on non-banded bowls. It was common to apply exterior decoration that had no relationship whatsoever to the interior design, but there are several cases of coordination of the different fields of decoration. Perhaps the best example is the bowl illustrated in figures 191k and 199. The three-part design on the interior is complemented by three isolated, blanketlike figures on the outside and a rim decoration that changes style three times. The three sets of foci all coincide.

The centers of bowl interiors were never included in the primary field of decoration, except in some of the sectored layouts. Most often the potter left this space completely empty, but in 13 instances a figure was painted there. Three times, simple dots or short dashes depended from the primary layout border or a figure concentric to it (fig. 192a). Four Centered layouts were enhanced by central figures concentric to the lowermost layout border (fig. 191f). Nonconforming figures (fig. 197) appeared six times.

Rim decoration on all but two bowls appears as some form of ticking (fig. 200). Lines, dots, and short dashes occur as often in combined patterns as they do alone. The more complex combinations are absent on McElmo Black-on-white.

Uses. Many bowls were pieced together in the laboratory from potsherds removed from the fills of rooms, kivas, and areas, where they had fallen from their original resting places. Others came from trash deposits into which they had been tossed following breakage. Few were found where the Indians had left them.

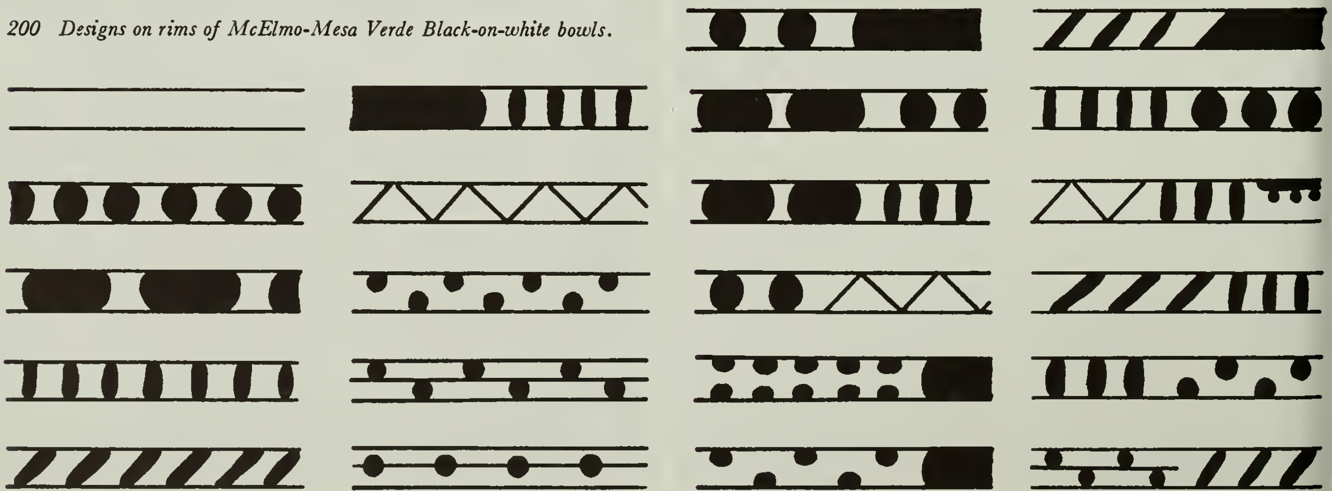
Six bowls were found in graves. Five 1.2-liter bowls appear to have been intentionally placed with the dead; one large bowl had been broken, and its sherds lined the downslope side of the Burial M6 grave. A smaller bowl with Burial M6 contained arrowpoints, paint stones, and other stone objects. A single bowl with Burial M30 was only slightly tipped from the horizontal and could have held some perishable substance. The two bowls with Burial M5 were inverted over the woman's head and could not have contained anything.

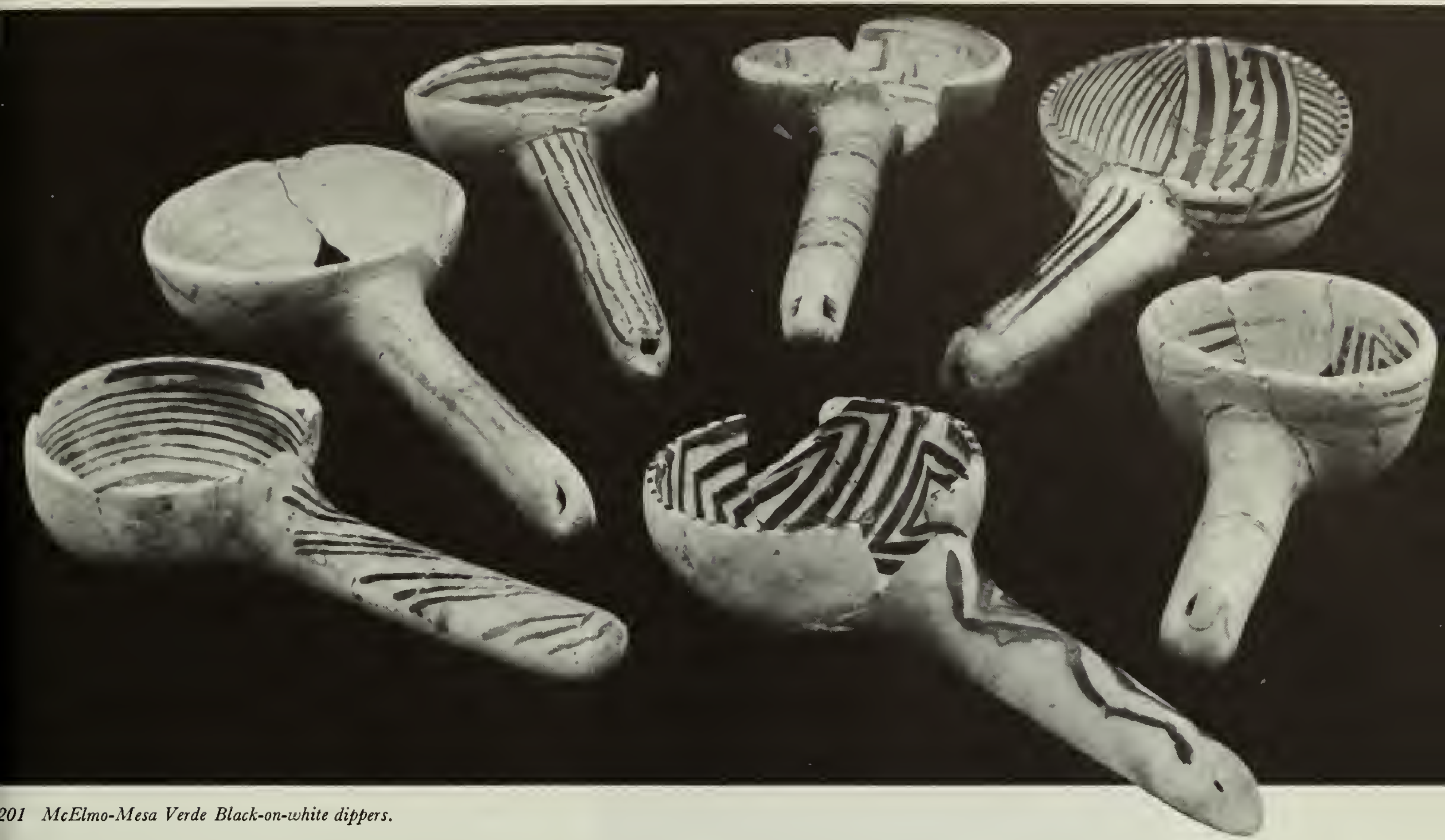
Three bowls (figs. 175c, 184a, and 189a) were discovered resting on the floor of Kiva D, along with two other pottery vessels and numerous stone artifacts, as if they had been used there. Neither size nor design are consistent among them. Three others lay on the floor of Room 71 (fig. 178c), next to a hearth with various cooking implements. Their position suggests some connection with the task of preparing meals, even though very few bowls had soot on their exteriors.

Another group of three bowls (figs. 178d and 183d) was removed from storage Room 79, together with two large corrugated jars. The bowls may have contained items for immediate use, or they may have been placed in the storeroom for safekeeping.

The two size classes of bowls suggest differences in function, and contrasting designs may also have been associated with differing purposes. For example, historic Zuñi pottery made for ceremonial occasions bears decorations quite different from those used on everyday utensils.

200 Designs on rims of McElmo-Mesa Verde Black-on-white bowls.





201 *McElmo-Mesa Verde Black-on-white dippers.*

McElmo-Mesa Verde Black-on-white Dippers

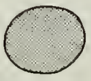
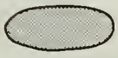
Only 14 of the 34 McElmo-Mesa Verde Black-on-white dippers (or ladles) from Mug House can be classified as Mesa Verde Black-on-white. This is the only shape class where McElmo Black-on-white is in the majority. Possibly the McElmo decorative style persisted longer in dippers than in other forms. It seems unlikely that more dippers were held as heirlooms than any other kinds of pots.

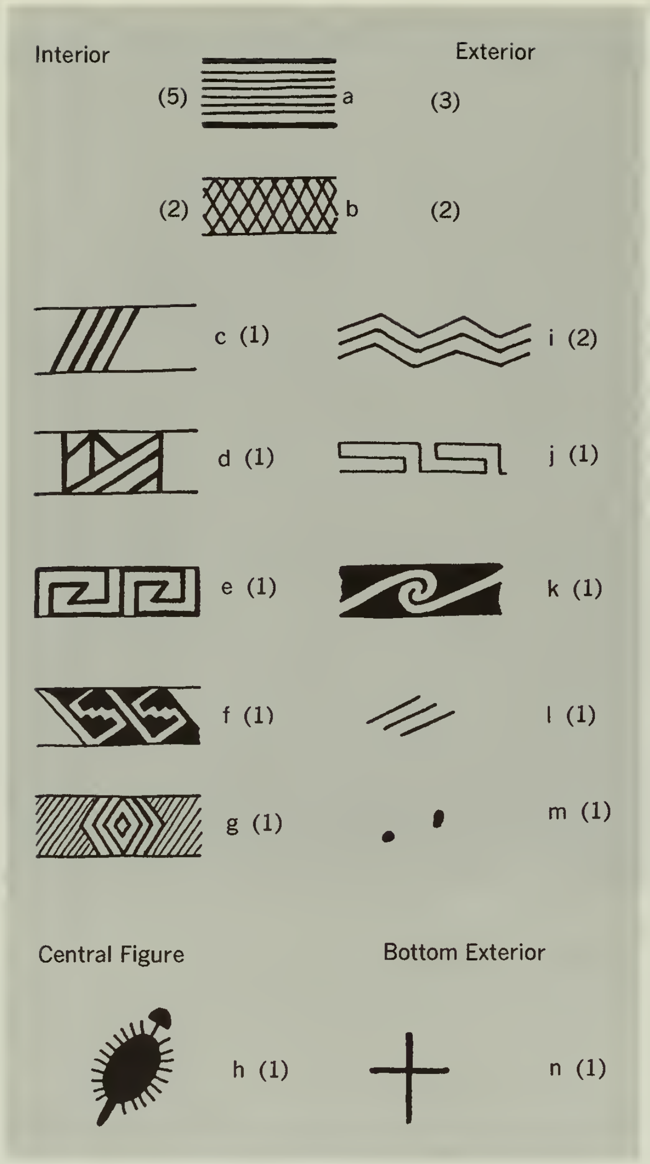
Shape. Dipper bowls generally have the same shapes as the typical smaller bowls (fig. 201). Their height is consistently less than half the maximum diameter, which always coincides with the mouth. Dipper handles are usually attached between the bowl rim and bottom. Occasionally the underside of the handle forms a straight line with the bowl base. Twenty-one bowl bases were flattened.

Rims. Only one rim was definitely tapered and rounded All of the others are untapered and flattened or rounded. Of the 30 specimens, all but one rim showed signs of wear from dipping.

Handles. The typical handle in cross section is round and hollow, but several solid forms indicate considerable freedom of manufacture (table 19). Perforations occurred in the upper surface of about one-quarter of the hollow handles and ran completely through one solid handle. Small openings at the ends of several handles do not appear to be functional. Two hollow handles rattled when they were shaken. Seemingly, clay pellets had been placed inside when the handles were being formed.

TABLE 19.—DIPPER HANDLE SHAPES

	Cross section	McElmo B/W	Mesa Verde B/W	Total
	Hollow-round	10	9	19
	(Perforated)	(3)	(2)	(5)
	(Unperforated)	(4)	(3)	(7)
	(Rattle)	(1)	(1)	(2)
	Solid-round	2	2	4
	Flattened	2	1	3
	(Perforated)	(1)	......	(1)
	Trough	1	......	1
	Triple	1	1	2
	Totals	16	13	29



202 Band and other designs on McElmo-Mesa Verde Black-on-white dippers. a–g, k, Band designs; i–j, encircling figures; and h, l–n, isolated figures.

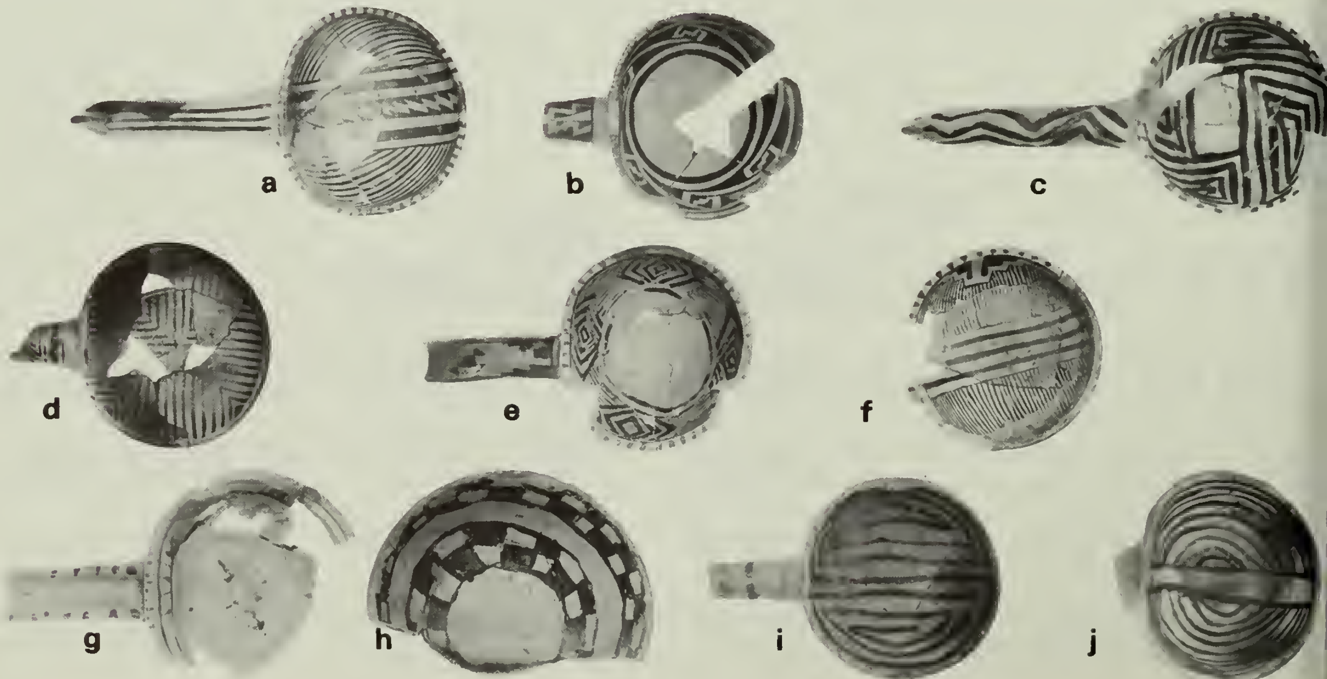
Size. Dipper sizes are relatively uniform in compariso to other vessel groups. They roughly equate with th smallest of the bowls. The approximate capacities of 1 dippers were measured. Two-thirds of these held betwee 0.26 and 0.42 liter. The mode of the class is one-third of liter. Two smaller dippers contained around 0.15 liter while four others held from one-half to two-thirds of liter. Typical maximum bowl diameters range from 11. to 13.8 cm., and heights are between 4.8 and 6.2 cm

Decoration. Dippers were decorated in the same manne and style as the bowls. Decorative fields are identical t those of the bowls with two exceptions. One ladle bear a painted mark on the bottom of the outside. An additional field was available on the handle, the top portion of which were often painted. Layouts are much mor restricted than in bowls. Bands, unbounded band typ distribution (Leavitt's "organizational bounded band") halved, and quartered exhaust the inventory.

Dipper layouts	McElmo	Mesa Verde	Tota
Bands	6	6	1
Unbanded lines	4	......	
Sectored–Halved	10	6	1
Quartered	....	1	
Offset quartered	....	1	
Totals	20	14	3

Figure 202 shows the motifs found in the band layout both inside and out, as well as some encircling and isolated figures. Familiar figures include the parallel-lin band design, diagonal crosshatching sometimes elaborated with dots, lines, or alternately filled diamond creating a sort of checkerboard, parallel oblique lines opposed stepped triangles (fig. 203b), interlocking

203 McElmo-Mesa Verde Black-on-white dipper designs.



double crooks with connecting lines, and nested diamonds set against a hatched background (fig. 203e). Exterior designs include six band patterns (one an interlocking scroll), parallel zigzag lines, parallel straight lines, a fret, and isolated figures (fig. 203g). One animal or insect figure had been painted in the center field (fig. 203g), a simple cross occurred on the outside bottom of one vessel, and pendent dots invaded the central field on two occasions.

The four unbounded linear designs with a band type distribution include a series of parallel meandering lines (fig. 204b), a fret making use of the rim for part of the line (fig. 204a), repeated sets of nested chevrons pendent from the rim, and a series of short angled lines painted next to one another around the interior of the bowl below the rim.

The many halved designs might also be termed bilateral. The preponderance of these layouts may stem from the greater ease with which they could be applied to small ladle bowls having a higher proportion of horizontal field than vertical field. They always exhibit bilateral symmetry. The two spaces are often filled by linework deployed into concentric or semiconcentric figures (fig. 203j), spiraling angular and curved lines (fig. 203i), or nested chevrons (fig. 204c). Zones of hatching or crosshatching on opposed sides set off lines, rows of dots, and barbed lines that run across the whole field (fig. 203a, f). In one case, two pairs of stepped triangles hang from the rim on opposite sides of the crossing lines (fig. 203f).

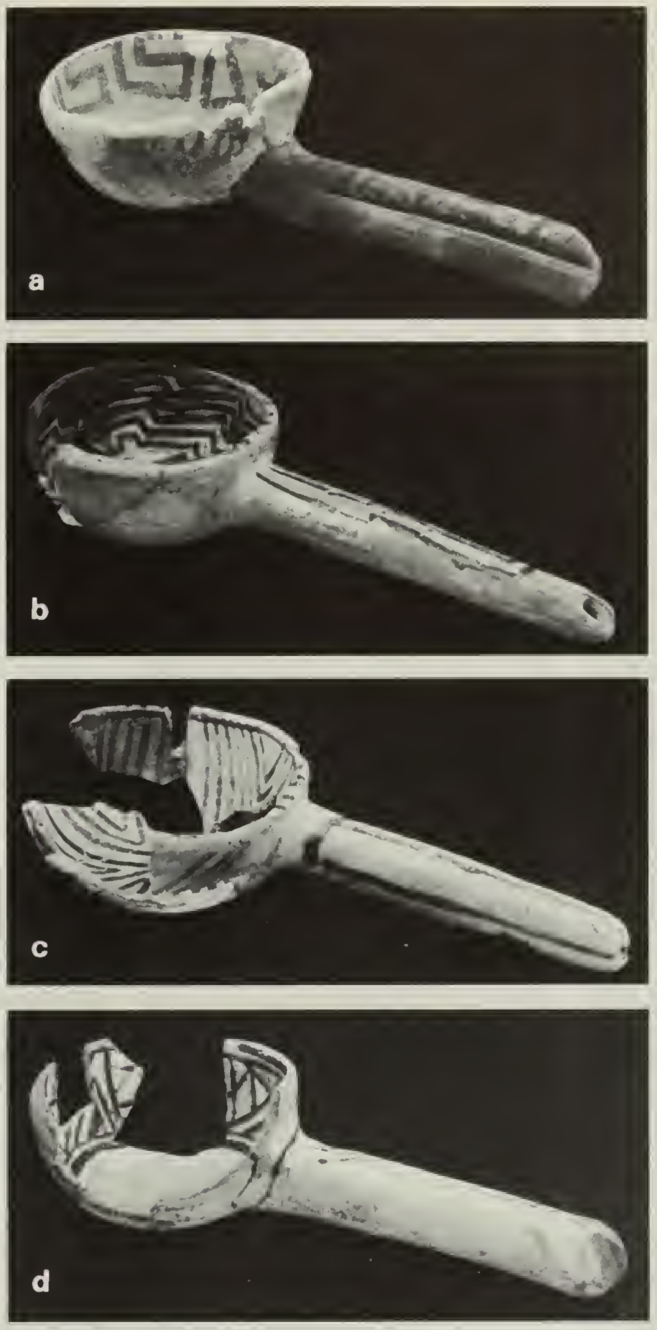
The four spaces in the one Quartered layout were filled by nested chevrons outlining small isosceles triangles depending from the rim (fig. 203d). Triangular scrolls filled analogous spaces in the Offset Quartered layout (fig. 203c).

All reasonably intact handles bear some decoration on their upper surfaces. Most are linear figures consisting of horizontal, oblique, or vertical straight lines, zigzag lines, and one cross-ticked line (railroad track). Only two handles carried solid figures—stepped triangles, square with external corner triangles, and opposed triangles forming a pseudo-negative zigzag line. The raised sides of the single troughed handle are decorated with dots in the manner of rims (figs. 203 and 204).

Six rims are undecorated; one is painted with a solid stripe. All others (except three that are too badly worn to tell) have been ticked in patterns identical to those on bowls. Dots and short dashes running vertically or obliquely cover most rims. There are single examples only of the zigzag line and alternating small dots.

Uses. Consistent wear on rims of dippers, not observed on other vessel forms, must have resulted from the repeated ladling of substances out of larger containers, such as stew out of cooking pots. Also, small implements would have been needed to fill water jars at springs. The absence of soot on dippers shows they were not held over the fire.

Dipper handles suggest, besides the obvious one of grasping, other possible uses. Do the rattle handles represent simply a desire for a noise-making device, or were they made for specific occasions? Holes in the ends of some handles are large enough to permit passage of a cord by which the dippers could be suspended. The vast majority of handles, however, either have no such openings or the holes are too small to thread.

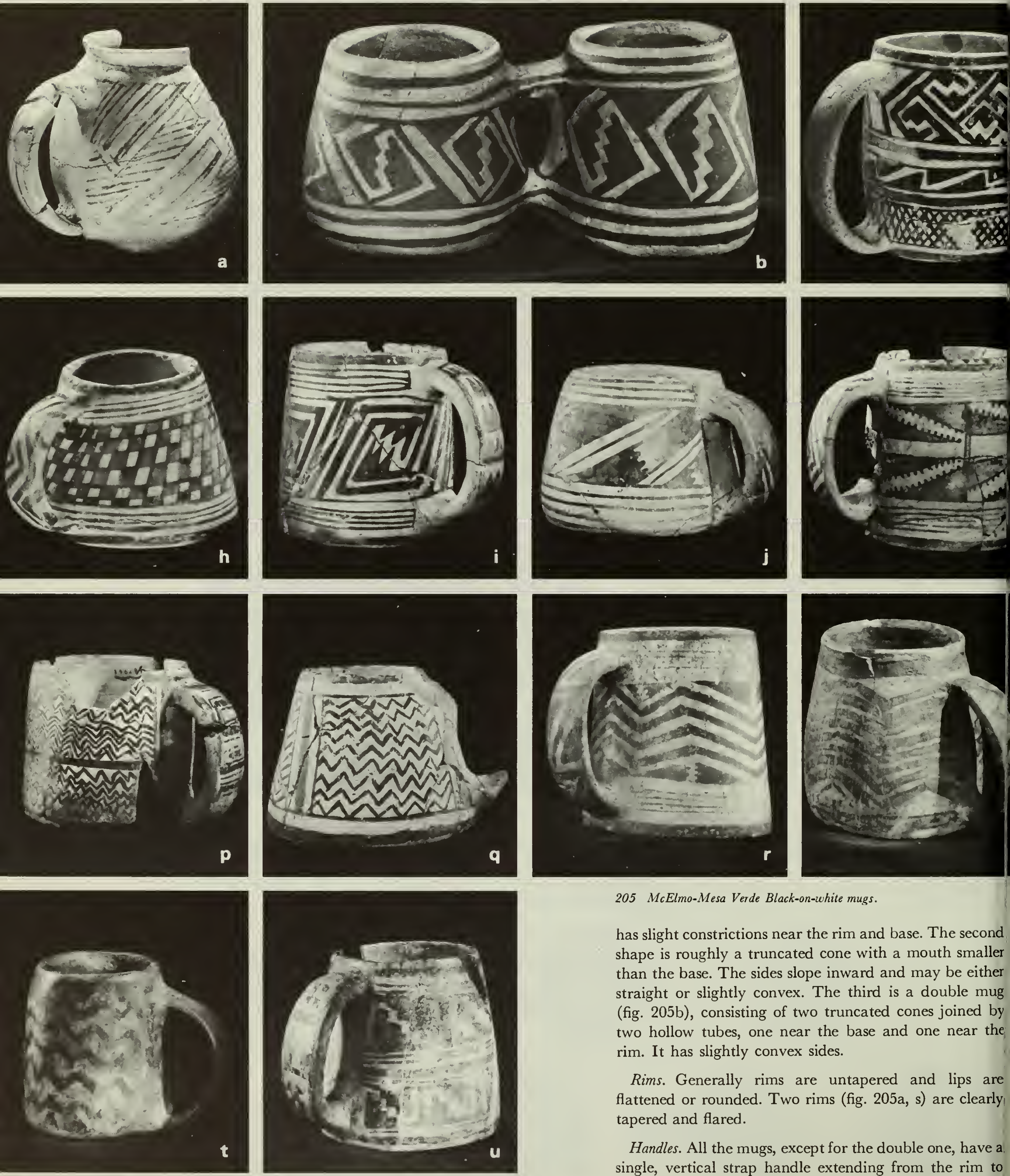


204 McElmo-Mesa Verde Black-on-white dipper designs.

McElmo-Mesa Verde Black-on-white Mugs

Twenty-seven mugs were recovered from Mug House and two were found with burials in nearby Adobe Cave. Twenty-five of these, including one double mug, can be classified as Mesa Verde Black-on-white, leaving four that may be McElmo Black-on-white. They all appear to be much alike and may have been made by a single group of potters.

Shape. There are three main shapes, all with flat bottoms (fig. 205). One approximates a cylinder with nearly equal base and mouth. Its sides may be straight or convex, producing a barrel shape. One mug (fig. 205a)

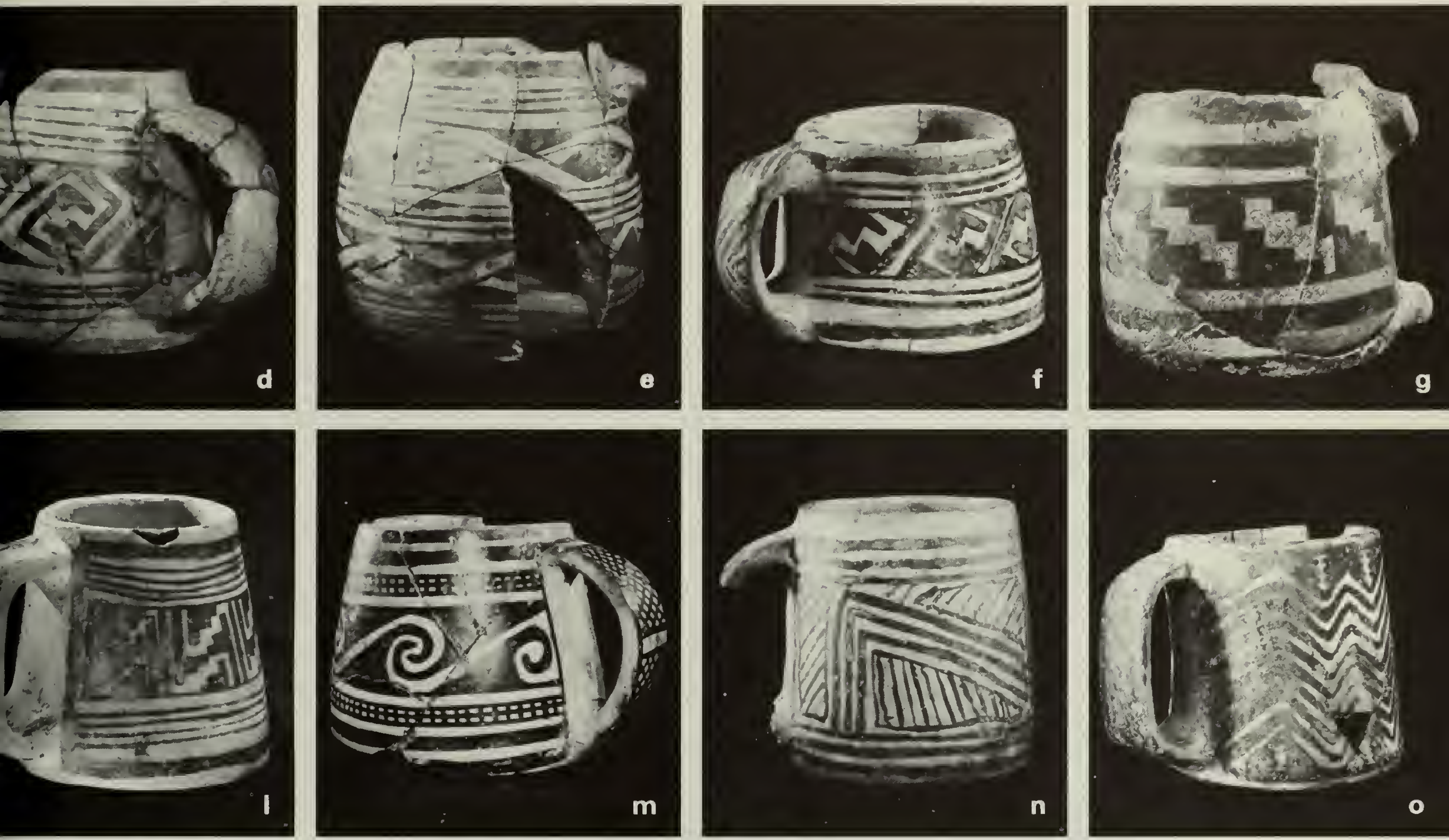


205 McElmo-Mesa Verde Black-on-white mugs.

has slight constrictions near the rim and base. The second shape is roughly a truncated cone with a mouth smaller than the base. The sides slope inward and may be either straight or slightly convex. The third is a double mug (fig. 205b), consisting of two truncated cones joined by two hollow tubes, one near the base and one near the rim. It has slightly convex sides.

Rims. Generally rims are untapered and lips are flattened or rounded. Two rims (fig. 205a, s) are clearly tapered and flared.

Handles. All the mugs, except for the double one, have a single, vertical strap handle extending from the rim to

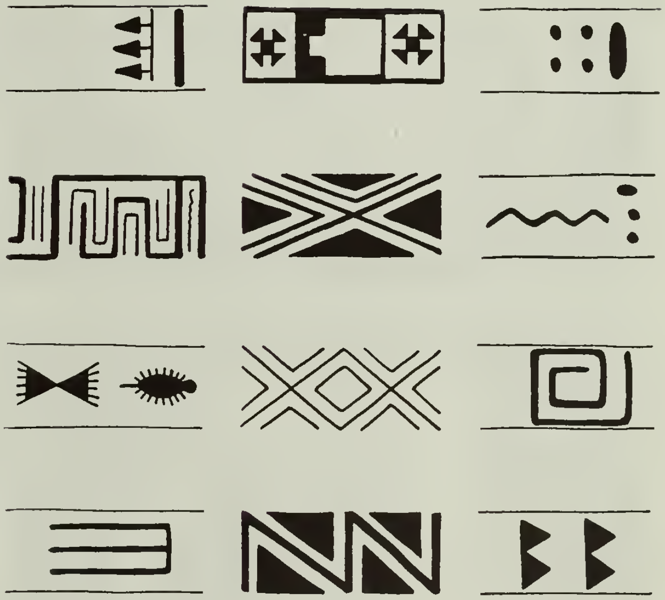


the base. One mug has a small piece resembling a T-doorway cut out of its handle; a similar figure is painted on another mug (fig. 205u). Mugs whose handles had broken off continued to be used.

Decoration. Mugs have three decorative fields: exterior walls, lips, and the exteriors of handles. All layouts are bands. Twelve bands are unsegmented, and the other 17 are subdivided vertically or diagonally. Independent segmenting lines are visible on five bands; all others are ncorporated in the design. Framing line patterns are ike those on bowl interiors.

The band designs use only eight basic motifs, all of which appear on bowl interiors also. Occurrences of these motifs are tabulated below.

Motif	Occurrence	Illustrations
Parallel zigzag lines	7	Fig. 205o–t.
Oblique checkerboard	2	Fig. 205h.
nterlocking scrolls	1	Fig. 205m.
Opposed stepped triangles	13	Fig. 205b–d, f, g, i, l, u.
Opposed ticked triangles	3	Fig. 205e, j, k.
Opposed right triangles	2	Fig. 205c, n.
Diagonal crosshatching	1	Fig. 205c.
Solid lines flanked by hatching	3	Fig. 205a, n.



206 Designs on McElmo-Mesa Verde Black-on-white mug handles.

Twenty-one of the 25 intact handles are painted. Four are decorated like the main band motif, while 18 bear designs distinct from the primary band. Four handles carry sets of parallel zigzag lines, 3 are cross-hatched, 11 are painted with various individual figures like those found on the exteriors of the bowls (fig. 206). Two are banded.

Twenty-seven rims are ticked with simple dots or short dashes, continuously or in groups. Dashes on three of these are arranged diagonally; on two, in zigzag lines. The rims of two mugs are undecorated.

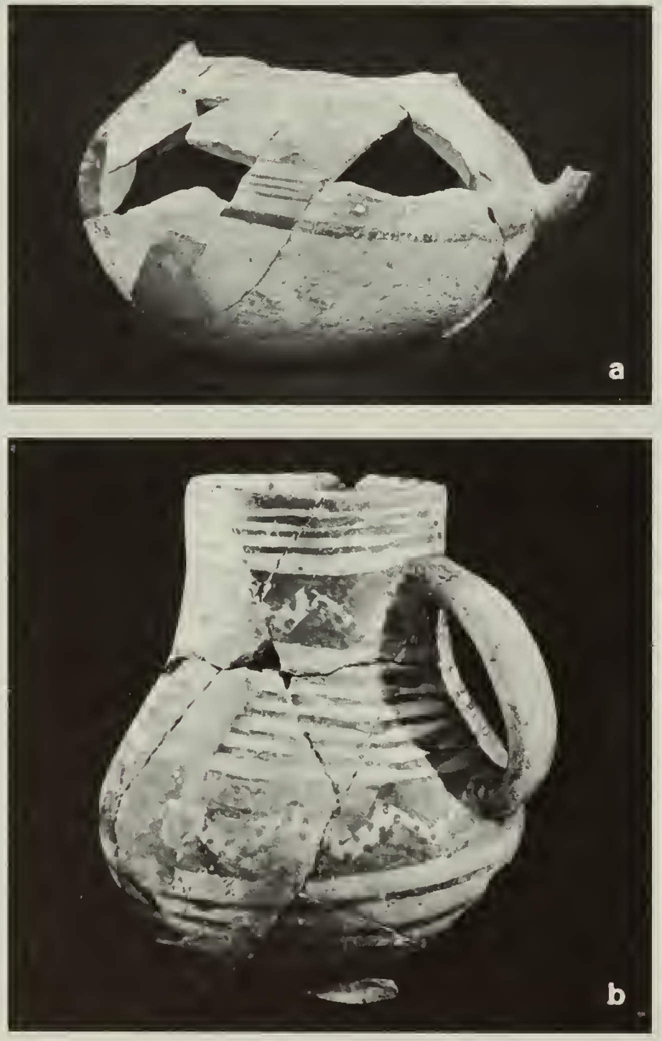
Overall dimensions show considerable variation. Heights range from 5.7 to 11.9 cm., and maximum diameters from 7.4 to 12.0 cm. They could hold from 0.17 to 0.60 liter. Nine mugs stand higher than their greatest diameter (these include the four McElmo Black-on-white), while 20 have diameters greater then their height (all of these are Mesa Verde Black-on-white).

Uses. Mugs were obviously drinking utensils. Five mugs occurred with burials and five others were found on room floors. Eighteen mugs in the fills of rooms and kivas had apparently fallen from higher floors of collapsed rooms. No mugs were found on the floors or banquettes of kivas. One was recovered from the refuse deposit in front of the village.

McElmo-Mesa Verde Black-on-white Pitchers

Only two restorable pitchers were found, both Mesa Verde Black-on-white. Both have white slipped, polished, and crackled surfaces decorated in organic paint. The more complete pitcher shown in figure 207b has a roughly globular body and a short, cylindrical neck with an untapered and rounded rim. A solid strap handle runs from the shoulder to the neck. A double band design was applied to the exterior. The motif, a broad negative zigzag line partially filled with black dots running the circumference of the band, was also painted on the handle. Simple dot ticking adorns the rim.

207 McElmo-Mesa Verde Black-on-white pitchers.



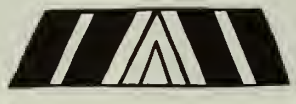
The neck and most of the handle of the second pitcher are missing (fig. 207a). The body is decorated with pairs of opposed serrated triangles used to fill the spaces formed by a running zigzag line between two parallel straight lines. The stub of a solid strap handle is attached to the point of maximum diameter and is painted with opposed stepped triangles.

Both pitchers have flat bottoms. They were found in fill deposits at opposite ends of the lower cave.

McElmo-Mesa Verde Black-on-white Canteens

Three globular canteens with constricted necks and pairs of solid loop handles came from three separate rooms. Interior surfaces are unslipped and scraped, but exteriors are polished even though only one is slipped white. Two have crackled surfaces.

Like other jars, the canteens bear painted ornamentation on the upper half of their bodies, on handles, and on rims. The McElmo Black-on-white vessel (fig. 208a) has a band layout subdivided into four segments, each of which contains this motif:



This vessel also has a white slip and a flat bottom. Both the handles and rim are ticked with dots.

A 4-part band design is also used on figure 208c. Four pairs of opposed stepped triangles, arranged in crude diamonds, are set in a straight-line hatched background. This design is typical of many Mesa Verde Black-on-white jars. Simple dot ticking covers the rim and single lines are on the sides of the handles.

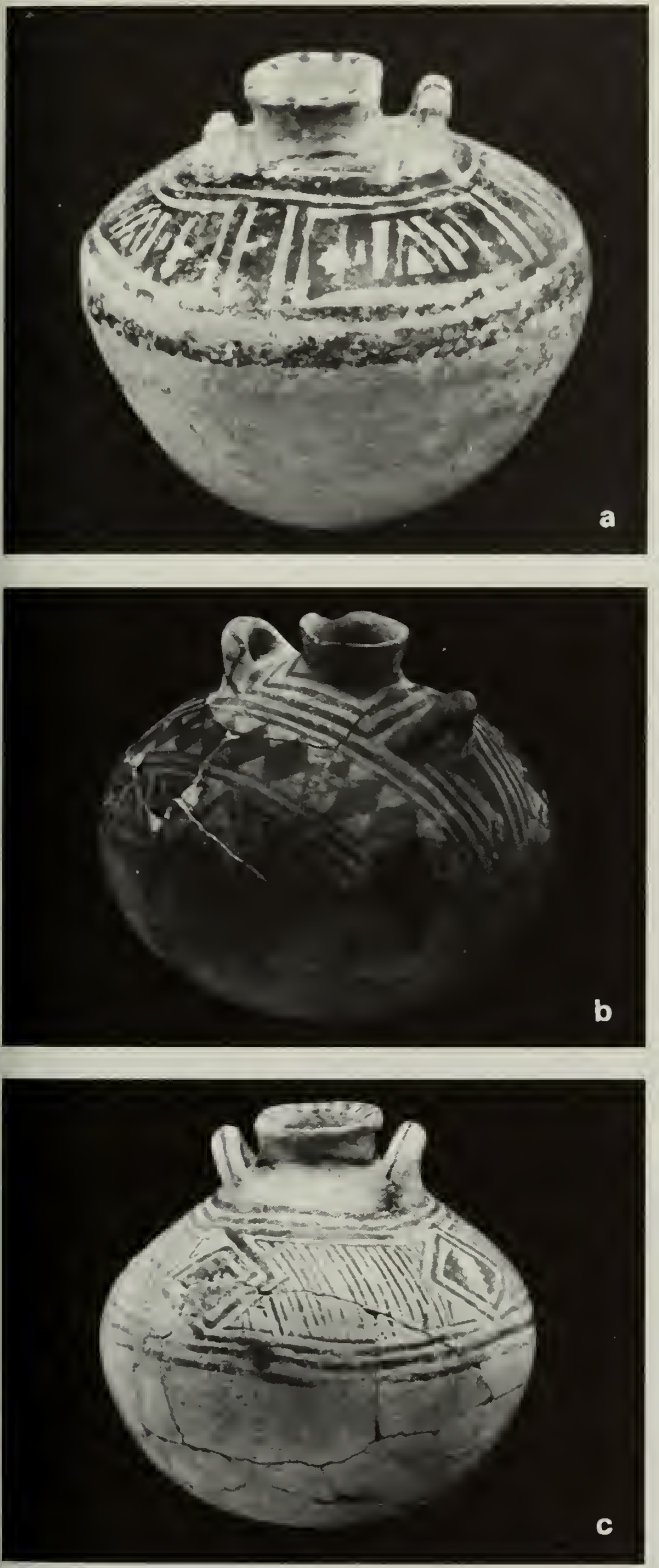
The other Mesa Verde Black-on-white canteen (fig. 208b) bears a 2-part decoration of panels, each side mirroring the other. One panel on each side contains a series of solid diamonds running corner to corner; the other contains three S-shaped triangular scrolls. One handle is covered with short straight lines running transversely, the other with unfilled diamonds. The rim is unpainted. These latter two vessels both have indented bottoms and are unslipped.

The first two canteens described were sufficiently complete to permit measurement of their capacities. The smaller one held 620 cc. of water and the larger one about 2,760 cc. The capacity of the third canteen is nearly equal to that of the latter.

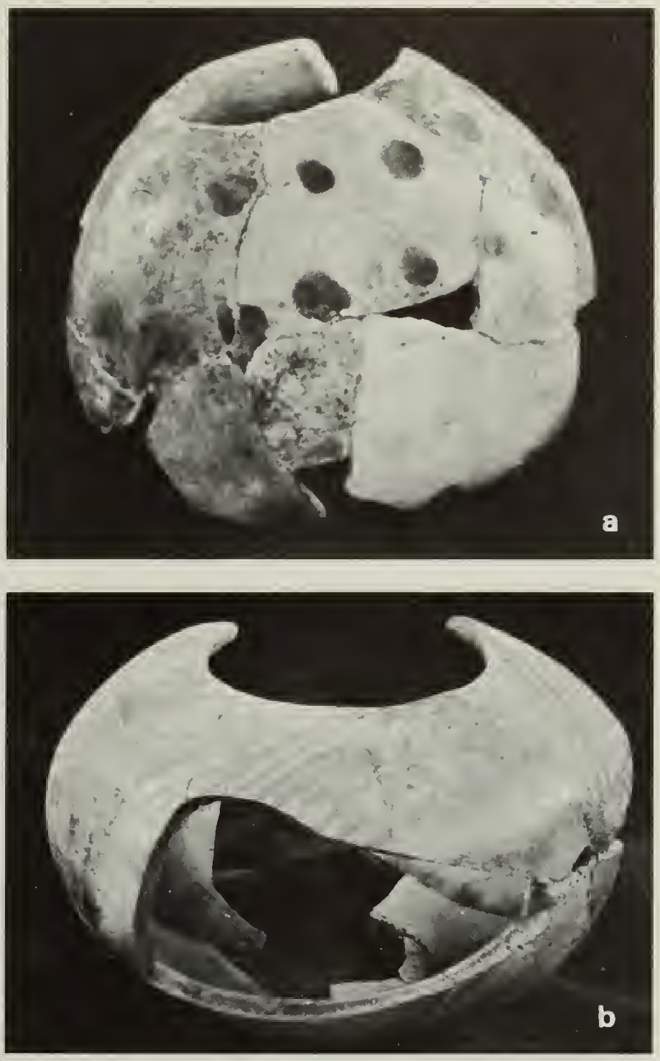
McElmo-Mesa Verde Black-on-white Seed Jars

Pieces of two small seed jars were found scattered about Courtyard C. Both had polished, slipped, and crackled exterior surfaces decorated with organic paint.

The smaller jar (fig. 209b) was virtually spherical with an opening in the top. Decoration consisted of two concentric circles of large solid dots around the mouth. Thi



208 McElmo-Mesa Verde Black-on-white canteens.



209 McElmo-Mesa Verde Black-on-white seed jars.

motif is common on Mancos Black-on-white, and a case could be made for classifying this jar as Mancos Black-on-white with organic paint. Material of this nature has also been referred to as "Wetherill Black-on-white" (Hayes, 1964). An equally good case could be made for classifying the jar as McElmo Black-on-white.

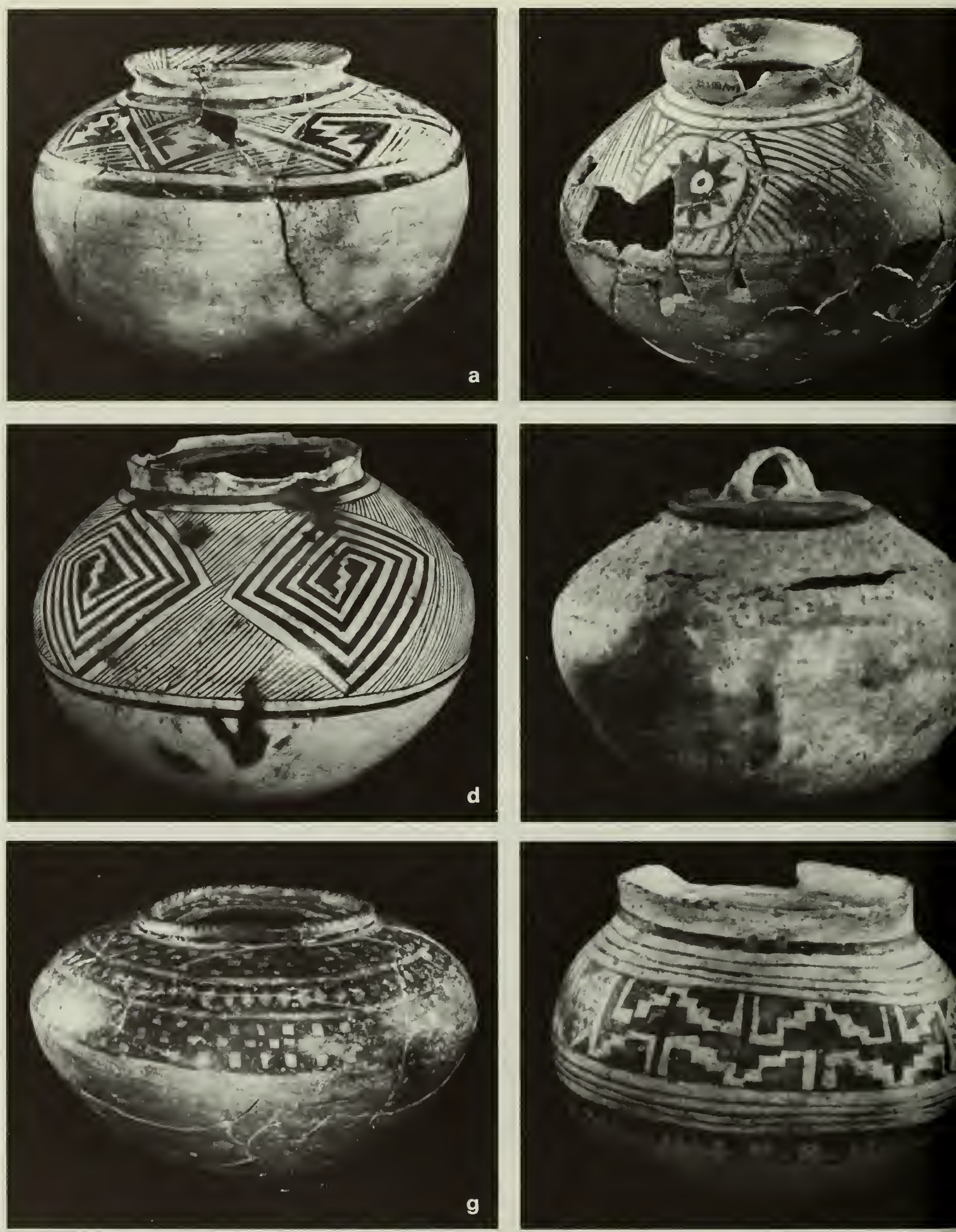
The diameter of the other jar (fig. 209a) is nearly twice its height. Four diagonally placed pairs of opposed stepped triangles are arranged in a band around the opening and divided from one another by areas of straight-line hatching. The design indicates that this pot is Mesa Verde Black-on-white, even though the gray slip and seed jar shape are more common in earlier pottery types.

McElmo-Mesa Verde Black-on-white Kiva Jars

Twenty-nine squat, globular jars with raised vertical ridges encircling the openings are identified as kiva jars. Twenty-five are classified as Mesa Verde Black-on-white and three as McElmo Black-on-white. One jar is indeterminate.

Shape. The shapes are identical to those of seed jars, but with the addition of a raised rim. Diameters always exceed total heights by significant amounts, with height/diameter ratios of 0.65 to 0.82. Shoulders are well rounded and only occasionally change the general curvature markedly. Nine of 14 intact bottoms are indented; 3 are flattened. The vertical rim is usually set back from the lip of the opening to produce a flange for supporting a jar cover. In one example, this flange is filled in to form an inward sloping bevel (fig. 210a).

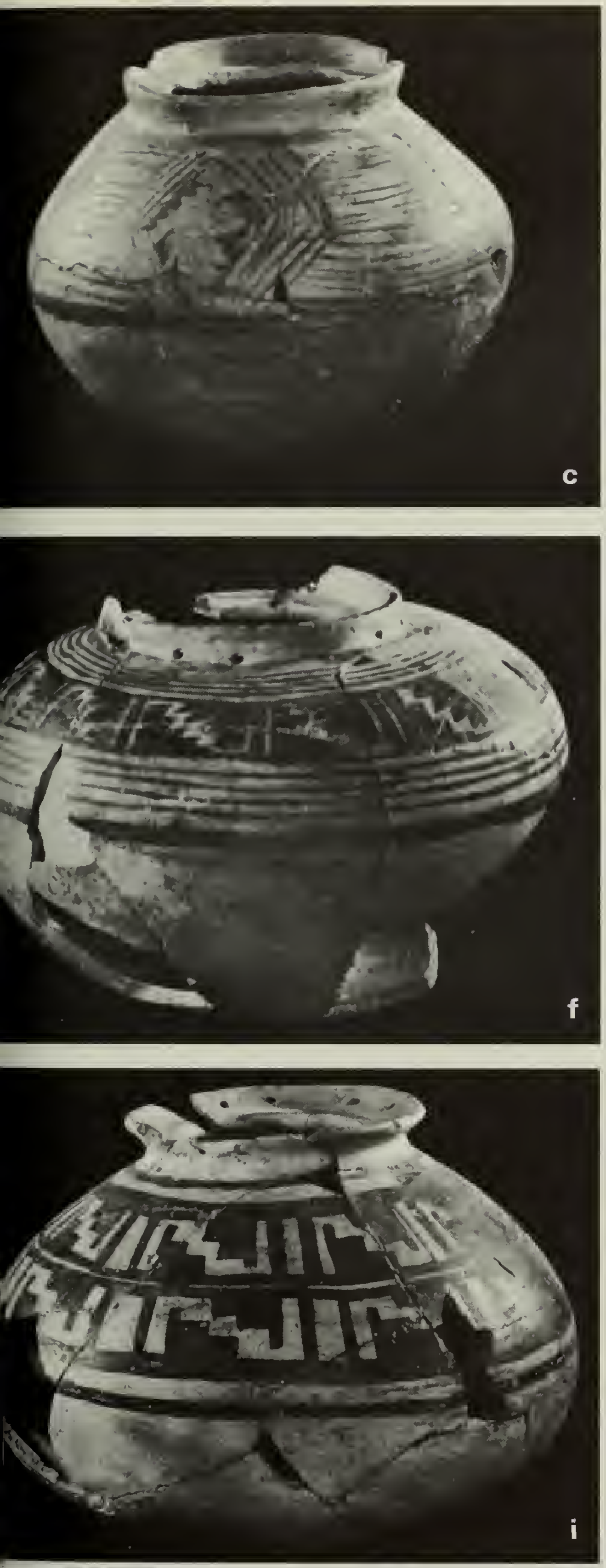
Holes for suspension. Kiva jars, like some seed jars, were equipped for suspension. Of the 27 vessels with intact rims, 16 have perforations placed symmetrically around the rim in two or four pairs. Most holes were formed



210 McElmo-Mesa Verde Black-on-white kiva jars.

when tiny sticks that had been pushed through the soft pliable clay burned out during firing, but one set was biconically drilled. The holes usually pierce the base of the raised rim, but two sets pass vertically through the flange.

Decoration. Only the upper exterior part of the bodies, the top of the raised rims, and the inside of the lips are decorated. The latter two fields bear decorations like those on bowl rims, with the addition of a series of triangles whose bases lie on the lip. All but one of the body designs are laid out in bands around the mouth. The single exception consists of large ovate dots arranged around the mouth in an unbordered band.



Motifs also duplicate the commoner ones found inside bowls, with a few notable exceptions. Opposed stepped triangles (fig. 210a, f, h, i), opposed isosceles triangles with dotted lines passing along the unpainted zigzag stripe between them, checkerboard (fig. 210g), and triangular scrolls are predominant. Five bands contain symmetrically placed solid figures surrounded by straight-line hatching (fig. 210b–d). A very unusual variation of this theme sets a solid stepped triangle in opposition to a hatched triangle, resembling the decorative style of Tularosa Black-on-white. Another band is divided into four segments in which diagonal panels of hatching and negative diamonds alternate. Another design consists of a zigzagging panel of opposed isosceles triangles forming opposed triangular spaces, each of which was filled with a hatched chevron and a solid isosceles triangle built around a small terraced triangle. All three of these last-mentioned designs are clearly within the Mesa Verde design tradition.

The lower half of kiva jars was always left unpainted, but there were two cases of decoration along the margins of this area. A series of pendent dots was attached to the lower border of one band, and four sets of three talon figures separated by square dots hung below the lower border of another (fig. 210h).

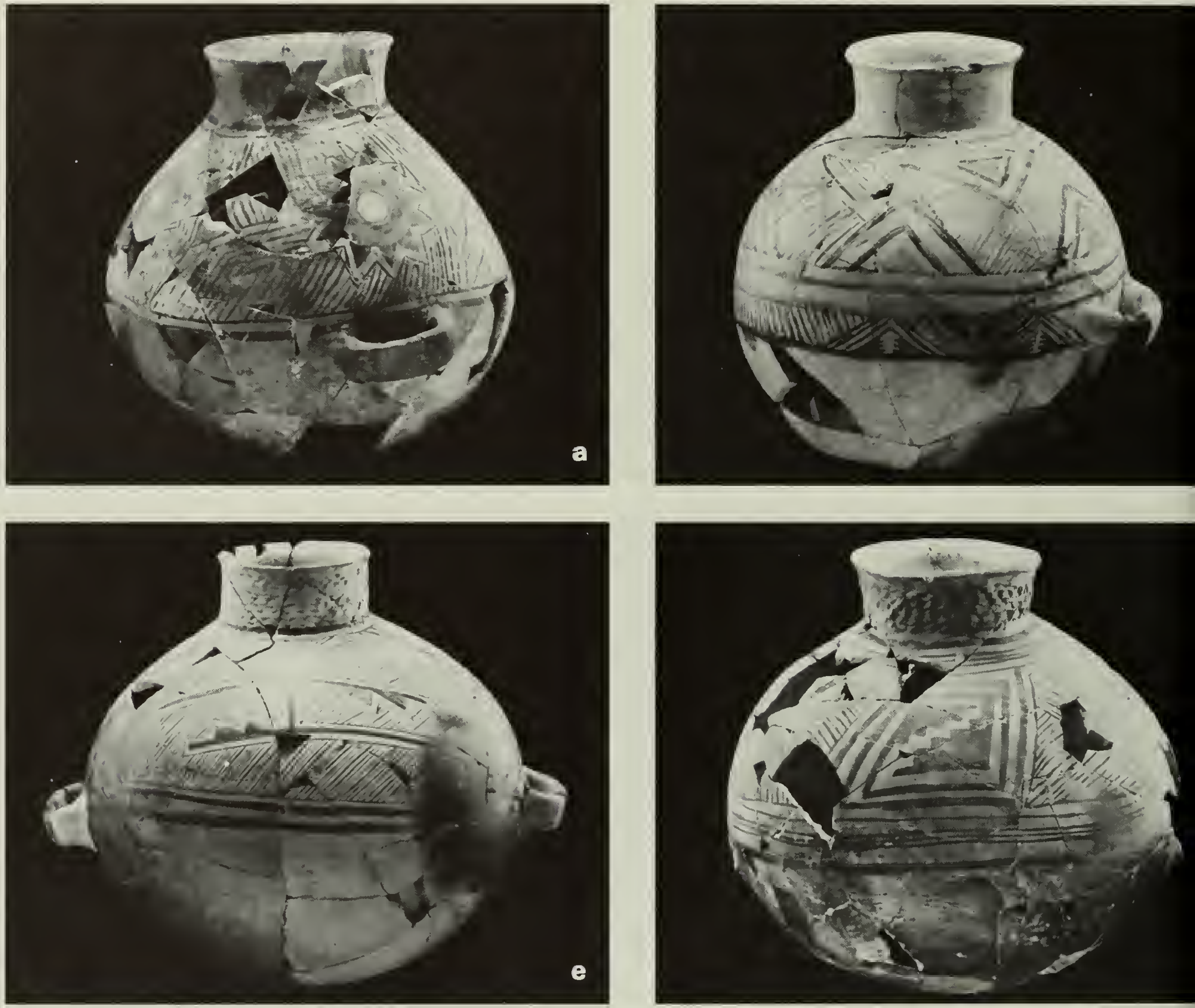
Size. Maximum diameters range from 13 to 26 cm., with 17 jars clustering between 17 and 21 cm., and 6 between 23 and 26 cm. Other diameters are less than 17 cm. The volumes of the four measurable kiva jars, with maximum diameters given in parentheses, are as follows: 0.56 liter (13 cm.), 1.4 liters (17 cm.), 2.0 liters (20 cm.), and 2.1 liters (19 cm.). These figures suggest a modal capacity around 2 liters for vessels with diameters of 17 to 21 cm. The larger vessels, with diameters up to 26 cm., may have held about twice as much. The smallest kiva jar seems to be in a class by itself.

Uses. The name "kiva jar" implies association with kivas, but in Mug House direct association of this class of pots with kivas was not observed. Of the six vessels found on floors, five were resting on room floors and the sixth came from the floor of Kiva G, onto which parts of several other vessels had fallen when adjoining rooms collapsed. Most of the other kiva jars were found in fills, where they had fallen from upper-story rooms or from the tops of kiva roofs (courtyards). Two were recovered from trash deposits.

There is a possibility that kiva jars were connected with ceremonial activities at Mug House, since in modern pueblos ceremonial objects are usually stored in secular dwellings and are taken into the kivas only when needed. Furthermore, the consistent presence of holes in the rims of these jars suggests that customarily they may have been suspended from ceilings rather than placed on floors.

Kiva jars were probably not used in the preparation of food; none of them are sooted from fires. They are impractical as serving utensils because of their small mouths. They are not large enough to hold worthwhile quantities of food, and they have not been found in typical storage locations (e.g., in storerooms or beneath floors). They most likely held non-liquid substances when they were used, since the construction of their mouths makes pouring difficult.

That lids were made especially for these vessels is indicated by the seats for them inside the rim and the presence of a number of decorated ceramic covers that fit onto the seats and have handles for easy removal.



211 McElmo-Mesa Verde Black-on-white water jars.

One jar and lid were found together on the floor of Room 22 (fig. 210e). Whatever was placed in these jars was apparently intended to remain there long enough to require a cover, but was not perishable enough to warrant the tight seals that were applied to water jars and to corrugated food storage jars. Thus the cookie-jar rim very likely indicates a cookie-jarlike function: holding objects or substances that were used or eaten periodically rather than all at one time. Such items might include seeds, feathers, paint materials, corn pollen, ornaments, pottery temper, small tools like polishers or scrapers, and various other belongings of value. Functionally, kiva jars are probably analogous to the so-called "feather boxes" of pottery or basketry in use prior to Pueblo III.

Another purpose may be mentioned for the rim perforations found on kiva jars and some seed jars. By running short sections of string through the perforations, one could tie a jar lid in place. The jostling of jars such as these could unseat even a well-fitted lid that was not tied down.

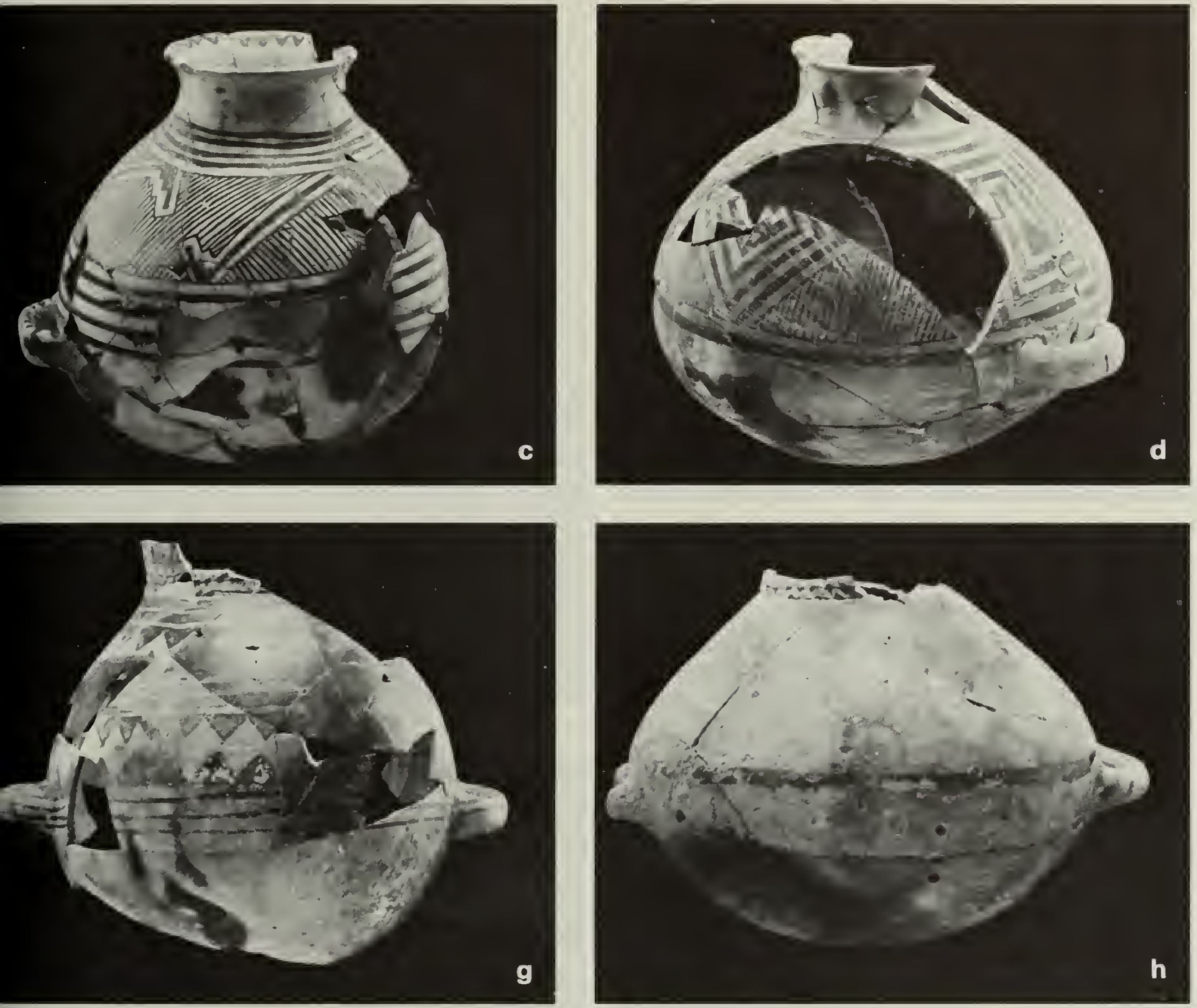
McElmo-Mesa Verde Black-on-white Water Jars

Large globular jars with small necks and handles have been termed ollas, or water jars, because of their similarity to vessels used historically among Southwestern Indians for carrying water. Twenty-one restorable water jars were found in Mug House. Fourteen are Mesa Verde Black-on-white and seven are McElmo Black-on-white.

Shape. Figure 211 illustrates the range in shapes. Sidewalls are well rounded, with no angular changes in slope. Some shoulders are fairly pronounced, but others in no way alter the degree of wall curvature. The height frequently equals but apparently never exceeds the maximum diameter. Maximum diameters always occur below half the total height and sometimes below half the body height. The small necks and mouths restrict access to people with small hands. All intact vessel bottoms are indented, to enable them to stand level.

Handles. Two horizontal strap handles project from opposite sides of the body, just below the shoulder. They were generally attached by fastening the ends of each strap into holes cut or left in the body wall. Each joint, inside and outside, was smoothed over. On one jar the stubs of the broken handles were ground down.

Decoration. The main design was applied to the upper half of the jar body, and secondary fields included the interior beveled surface of the flaring rim, the exterior



of the vertical neck, and the outer and upper surfaces of both handles. Rims carried the same decorations as the rims of other vessels. Simple dot or short dash ticking adorned most handles on their upper edges, but one also carried a solid broad line across its outer surface. Neck decoration was limited to only five jars. A single bird track had been painted on one of them, and the other four were corrugated.

All layouts can be called bands drawn around the circular mouth, which strikingly resembles the circular space so often left unpainted in the center of bowl designs. Several, however, give the appearance of Sectored or Centered layouts, and might have been so organized if there had not been an opening in the center. These designs present a unified pattern when viewed from above. They were most likely drawn from this viewpoint, using the opening as the center point rather than as the upper limit of a banded space. One vessel, for example, has bilateral symmetry within a virtually Halved layout (fig. 211e). Figure 211b belongs to the band motif of opposed isosceles triangles (in this case outlined by chevrons), but it may also be viewed from above as a five-pointed star. Another vessel gives a four-pronged pinwheel effect, while a pattern arranged in quarters with pendent triangular units appears on one jar surface as if it were a bowl turned inside out.

Solid figures set in a hatched background occur on nine jars, all Mesa Verde Black-on-white. Four symmetrically placed solid figures occur on seven (fig. 211a, c–d, f) and two on another. The ninth jar has the aforementioned five-pointed star. One vessel carries four solid painted figures on a gray unslipped background, with no hatching in the intervening spaces. One of the hatched background designs, although laid out in a band, is quartered, with a solid circular figure in each sector and the remaining space hatched. In another case, the total effect was achieved within a customary band construction by dividing the band into eight segments. Four segments are filled with opposed stepped triangles attached to interlocking rhomboidal scrolls, while alternating segments contain hatching (fig. 211f).

Solid banded patterns make use of typical bowl motifs, such as opposed stepped triangles, opposed isosceles triangles (fig. 211g) and rectangular and triangular scrolls. Other motifs are parallel lines, zigzag lines or panels of linear figures, and series of oblique parallel lines with elaborating triangles. A single broad line encircles the shoulder of one jar (fig. 211h).

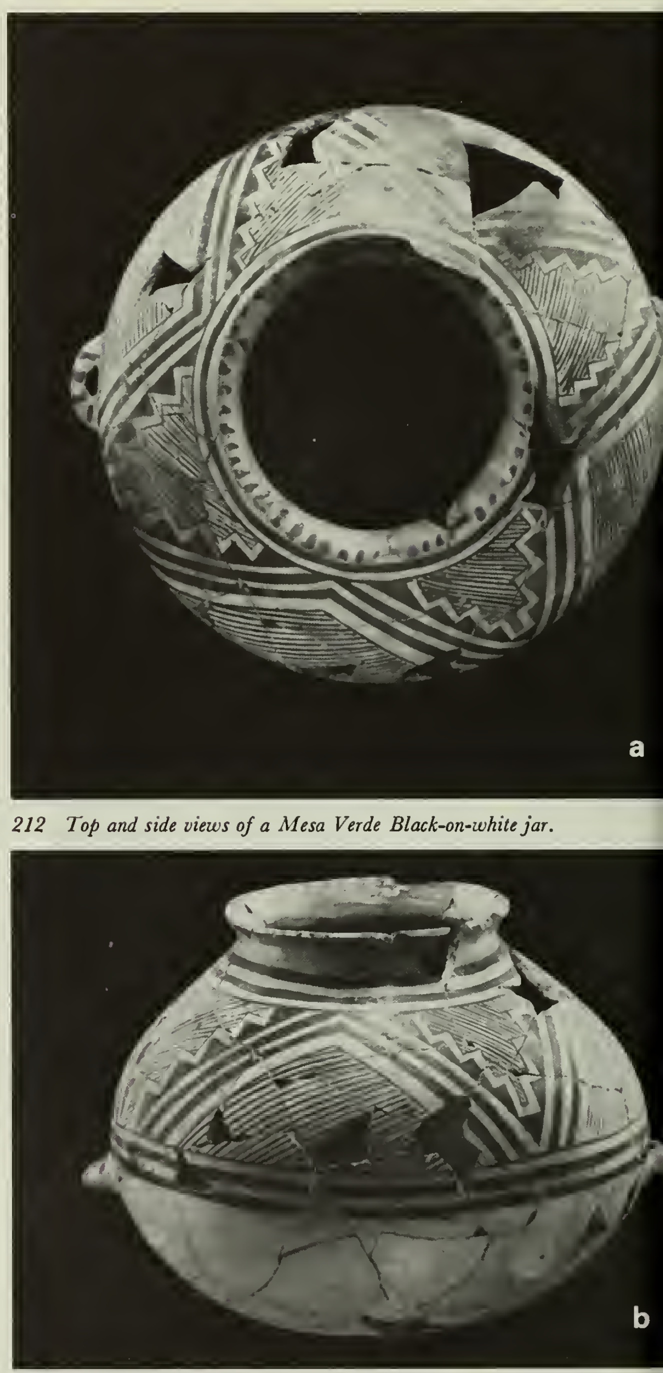
There is proportionately greater use of hatching on water jars than on other vessel shapes. No reason can be given for this circumstance. The primary decorative field is identical to that of a bowl turned inside out. Even the disadvantage of the centrally placed opening is equalled by the habit of leaving an unpainted circle in the bottoms of bowls. The space is no greater than on the large bowls, and the angle of view is more apt to favor a vertically oriented design rather than a horizontally oriented one. The explanation must lie in some individual preferences of the potters themselves, who associated hatched figures and the solid on hatched background style more often with water jars than with other forms.

Size. Maximum diameters of all 21 water jars fall between 24 and 36 cm. The capacity of one of the larger vessels measured 13.8 liters, suggesting that a typical water jar would hold about 12 liters. Twelve liters would be a heavy load—35 to 40 pounds including the pot—but it could be carried by one person.

Uses. Even though these vessels resemble modern Pueblo water jars, we should examine other evidence as to their function. The lack of soot and smoke blackening on the bottom and sidewalls argues against use over the fire in cooking. The globular shape with a small opening is practical for holding liquids, particularly in transit, and the height of the neck facilitates pouring liquids.

Such jars are the most logical vessels to have been used for hauling water to Mug House from the reservoir (about 100 yards away) or from Rock Springs (over a mile away). Canteens were too few and too small to make their use practical for this purpose. Corrugated jars rigged in slings and carried on tumplines would also make effective carriers, although more water would be lost through sloshing out of the larger mouths. The water jars could also have been carried in slings, or could have had cords tied through their handles. The woven yucca headring, to be described later, suggests that some vessels, probably these ollas, were carried on the head.

Water jars need not have been confined to carrying and storing of liquids. They would make excellent receptacles for meal or unground seeds and similar dry products that are often poured from one container to another in the same manner as liquids. The Mesa Verde Museum has on display a large water jar that had been filled with corn kernels and cached in a small cave in southeastern Utah.



212 Top and side views of a Mesa Verde Black-on-white jar.

McElmo-Mesa Verde Black-on-white Jars

Four jars could not be assigned to the categories described above. One vessel (fig. 212) resembles a water jar in shape and size, but lacks the relatively high neck characteristic of them. Its body is short and squat with well-rounded walls, and the rim is sharply flaring. Two vertically perforated lug handles are set opposite one another below the maximum diameter. The jar is 29 cm. in maximum diameter and stands 22 cm. in height.

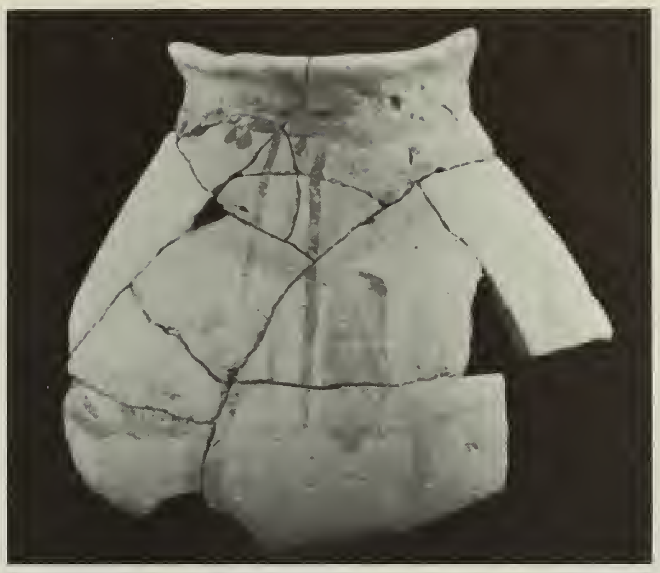
The main decoration is limited to the upper half of the body, and, although it is laid out between band border lines, it forms a centered four-pointed star. Proceeding in order from the central jar mouth are four hatched terraced triangles with bases at the mouth, solid serrated or stepped lines outlining the jogs of the terraced triangles and with apexes touching the lower band border, pairs of broad line chevrons, and large hatched isosceles triangles filling the remaining space with bases on the lower border line. This pattern can be viewed either as solid zigzag figures set in a hatched background, or as opposed hatched isosceles triangles with the intervening negative zigzag space filled with solid line figures. The interior side of the rim and top surfaces of the lugs are ticked with black dots.

The second vessel, a restored, nearly spherical jar, is the smallest one in the Mug House collection. It is only 11 cm. in diameter, and the orifice diameter is about half of this. There is no neck, but a sharply everted rim. Handles are lacking. A band design occupies the upper two-thirds of the body, and consists of four solid figures in the shape of a reverse D whose straight side is serrated by five pennantlike triangles. Crosshatching fills the spaces within the figure and around the outer edges, between the solid figure itself and the band border lines. Solids and crosshatched spaces are separated from one another by white unpainted background that outlines the black solids. The solid pennantlike triangles interfinger with opposed crosshatched triangles attached to the curved side of the next adjacent reverse D. This design represents a further adaptation of the solid figure on hatched background style which developed within the Mesa Verde ceramic design tradition. Sets of round black dots ornament the interior surface of the lip.

The third vessel, the spheroidal base of another small jar, cannot be classed with a specific shape group because the rim is missing. It is about the same size as the jar described above, and therefore could be similar to that vessel, or to a kiva jar, canteen, or pitcher. Fragments of decoration still visible show oblique panels of opposed alternating solid terraced triangles outlining horizontally hatched isosceles triangles.

All three of these jars are Mesa Verde Black-on-white. But classification of the fourth one is uncertain. Its exterior surface is unslipped, smoothed, and light brown in color. Beyond this, however, its other attributes are common to McElmo-Mesa Verde Black-on-white (fig. 213). The shape resembles that of the corrugated jars, with the upper body approximating a truncated cone. The rim is sharply everted, and there is no neck. Decoration was applied with an organic paint following a band layout around the upper half of the body. The resulting design seems to be little more than spaced sets of three vertical lines with both large and small irregular-shaped dots or blobs attached to the band border lines in between. This pattern is quite similar to that on several vessels from Mug House classed as McElmo Black-on-white. The inside surface of the lip is ticked with black dots.

The peculiar qualities and appearance of this vessel can probably be explained as an anomaly of firing. The interior surface and the inner half of the core is a medium to dark gray, like most Mesa Verde pottery. Temper also is typical: crushed rock and some potsherds. The light brown color of the exterior surface can be achieved by firing clay from the Mesaverde group in an oxidizing atmosphere, in contrast to the customary practice of keeping oxygen away from the pots during firing. In several spots, the organic paint has turned red, probably through a reaction of the vegetable juices with iron compounds in the clay, as demonstrated by Shepard (1957, pp. 385–386). This vessel may be either the result of experimentation with a firing technique new to Mesa Verde, or the work of a beginner. In either case, there seems to have been no attempt to duplicate this coloration, since no similar vessels or sherds were recovered. The pieces of this pot were found in the trash heap, where they could have been tossed immediately after firing. One is tempted to wonder how much ridicule and scorn were directed at this apparent ceramic miscarriage.

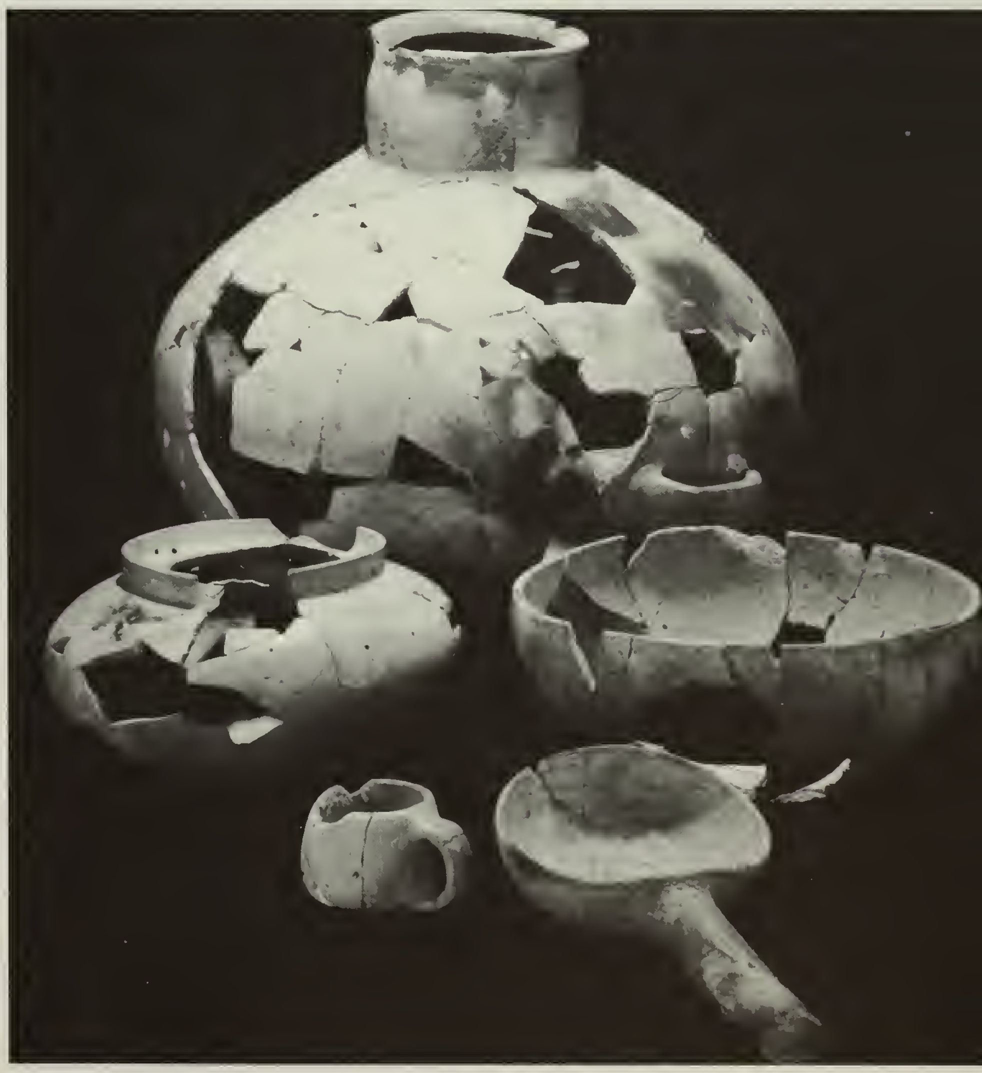


213 McElmo-Mesa Verde Black-on-white (?) jar.

Undecorated White Ware Vessels

If a number of the McElmo-Mesa Verde Black-on-white vessels had been completely manufactured up to the point of applying decoration and then fired, or if both painting and white slip were left off, a series of undecorated white ware vessels would result. One or

214 Undecorated white ware vessels with slipped surfaces.



215 Undecorated white ware vessels with slipped surfaces.

two cases might be attributed to experimentation or to a potter's haste to fire a group of pots before the advent of some other pressing activity. However, 18 such vessels were found in Mug House, and they are known from other parts of the Mesa Verde region. They represent all shapes characteristic of McElmo-Mesa Verde Black-on-white: 8 bowls, 3 dippers, 1 mug, 1 canteen, 1 kiva jar, and 4 water jars (figs. 214 and 215).

Most painted pots have extensive areas without painted decoration, but the primary decorative fields on all black-on-white vessels were always painted. Thus an unpainted sherd must represent a portion of the primary field of decoration before it is safe to assume that the entire vessel was unpainted. Since most primary fields are bounded in part by the rim or bear some clear spatial relation to it, and since rim sherds are about the only ones whose original position in the completed vessel can be visualized, a fairly sizable rim sherd would normally be required. Relatively small rim sherds of bowls and mugs can be used, but the rim and neck of a water jar are insufficient, since they include only secondary fields that are sometimes unadorned on black-on-white pots. For jars of this sort the sherd would need to include a large portion of the upper body attached to at least a small piece of neck for orientation. The 156 sherds tabulated in the Mug House collection as undecorated white ware are mainly bowl sherds, for the obvious reason that they are the easiest to identify. No sherds that could possibly have come from the unpainted bottoms of either bowls or jars were included. Undoubtedly many other sherds belong to this group, but they are not recognizable as such.

Technologically, this ware is identical in color and texture to McElmo-Mesa Verde Black-on-white. Temper includes crushed potsherds, crushed rock, and quartz sand in the following combinations:

Crushed potsherds—8
Crushed potsherds and rock—2
Crushed rock and potsherds—1
Crushed rock—5
Quartz sand—1
Crushed rock, sand, and crushed potsherds—1

Bowl interiors and exteriors and jar exteriors were smoothed or polished, and 11 vessels were slipped white or light gray (fig. 214). Crackling is common on the polished surfaces. Two of the large water jars were not finished beyond scraping (fig. 215, rear).

In general, the sizes of these vessels are comparable to their painted counterparts. One exception is a water jar which has a diameter of 39 cm., far greater than any painted water jar. This jar is further distinguished by a bulbous neck (fig. 214, rear). Another exception is a mug, smaller than any of the painted mugs. Only 5 cm. in height and 7 cm. in diameter, it resembles a modern baby cup.

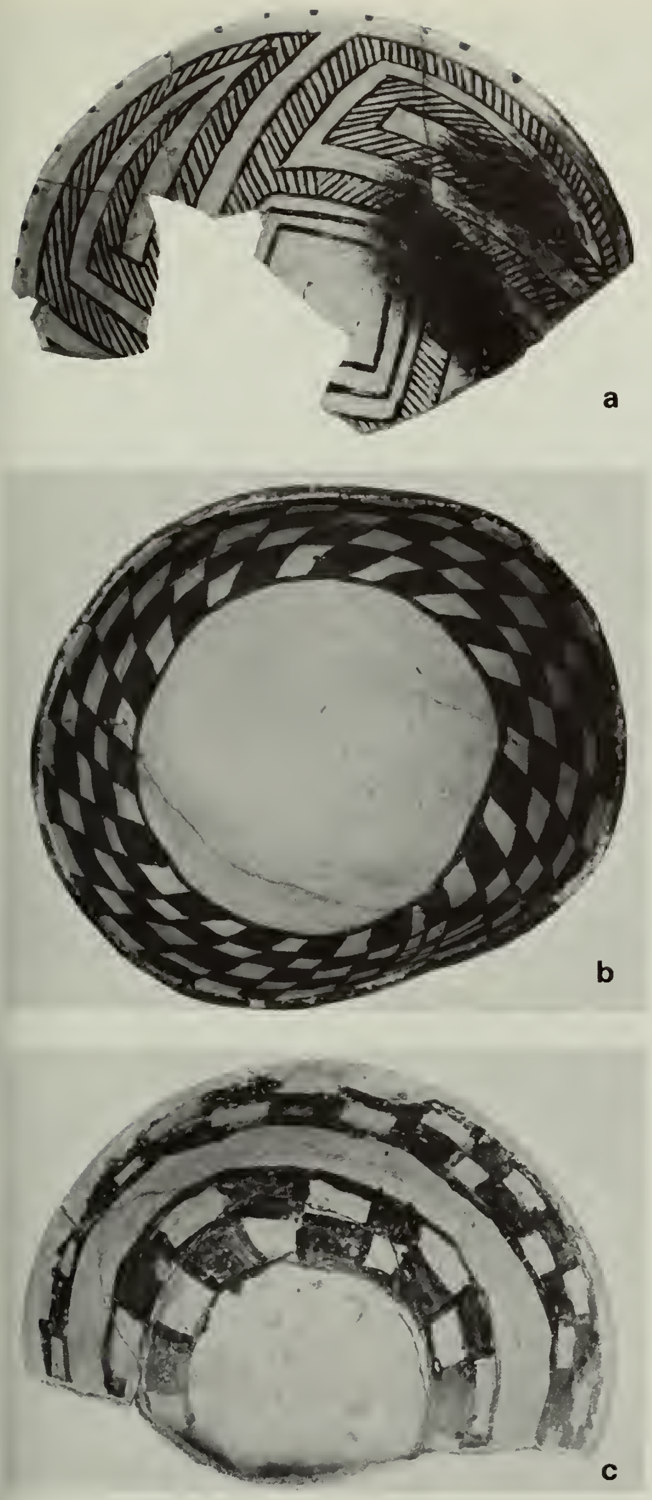
There is no reason to suspect that these vessels were employed for different purposes than the various black-on-white ones. One dipper bowl with a broken handle contained a fugitive red stain on its interior, as if it had served as a paint receptacle. Other small bowls may have been used in a like manner, having been washed out afterwards.

The 18 vessels and 156 sherds of undecorated white ware present a taxonomic problem. They clearly belong to the Pueblo III pottery complex found at Mug House, yet their frequency relative to corrugated and black-on-white is extremely small. However they may ultimately be identified, they should be classed technologically with McElmo-Mesa Verde Black-on-white.

Mancos Black-on-white Vessels

Five Mancos Black-on-white vessels came from the older deposits in and around Mug House. Three were bowls and two were the broken bowls of dippers. Four had slipped, polished, and crackled surfaces, and light gray paste indistinguishable in appearance from that found in McElmo-Mesa Verde Black-on-white vessels. The fifth, an incomplete bowl, was unslipped. Temper combinations are crushed potsherds, crushed rock, crushed sherds and rock, crushed rock and sandstone or sand, and crushed rock with some crushed sherds. Carbon streaks occurred in two cases. Vessel walls averaged 0.5 cm. thick.

The incomplete bowl, with crushed rock and sherd temper, was decorated in organic paint on the interior



216 Mancos Black-on-white vessels.

with widely spaced black dots on a squared rim (fig. 216a). A 4-part pattern of triangular scrolls running from the corners of a centered rectangle produces a pinwheel effect. Hatching fills the broad linear element of the figure. The bowl is broad and shallow, about 24 cm. in diameter and 9.5 cm. in height. The sidewalls flare outward at the rim.

Another bowl is decorated with a band of slightly oblique checkerboard squares in mineral paint on the vertical part of the interior surface (fig. 216b). A solid stripe on the rounded rim contains a break similar to the "spirit break" sometimes found in historic Pueblo pottery designs. The shape is nearly hemispherical, although the height (10 cm.) slightly exceeds half the diameter (19 cm.).

Both bowls were grave offerings with Burial M21, located about 50 yards north of Mug House. They can be definitely associated with the late Pueblo II Component A, since a rim sherd of one of the bowls (shown at the left corner of fig. 216a) was found in Layer V of the stratified trash slope in front of Mug House.

Another bowl, from Layers IV and V of the trash slope, is only about one-third complete. On its unslipped interior, several very broad vertical lines in organic paint depend from the ticked rim. Some of the joints between coils are visible on the exterior surface, showing that the construction coils were consistently made about 1 cm. thick. Maximum diameter of this bowl measures about 16.5 cm. and its height about 8 cm. The walls are 0.4 to 0.5 cm. thick, and taper slightly toward a rim with both rounded and squared segments of lip.

Part of a small dipper bowl was found beneath the floor of Courtyard C, where the extreme eastern end of the Pueblo II trash deposit was traced. There are mineral-painted solid figures on both the interior and exterior walls near the rim. The interior figures approximate scalloped triangles attached to two parallel meandering lines, while on the exterior a number of amorphous forms are jumbled together. The rim was well worn by use. The handle is broken off. There are three mend holes in the remaining part of the bowl, which was originally almost a perfect hemisphere.

Half the bowl of another dipper came from a mixed part of the trash slope. It, too, was a nearly perfect hemisphere with a slightly tapered and rounded rim. Two separated bands of checkerboard squares were executed in mineral paint on the interior (fig. 216c).

All five vessels belong to Component A, the earliest occupation of Mug House.

Cortez Black-on-white Dipper

About one-half the bowl of a small dipper, found in the lower fill of Kiva F, may be classified as Cortez Black-on-white. It approximates the lower half of a horizontal ellipsoid. It has a light gray, even-textured paste with a thick carbon streak. The temper consists mostly of crushed rock. Apparently, a small amount of crushed potsherds was also used. Both surfaces are white slipped, well polished, and crackled. Some of the brownish-black mineral paint has worn off, revealing the presence of a relatively thick organic medium. An interior band, using the rim for its upper border, is subdivided by thin vertical lines to which are attached various triangles and triangular elements ticked with long dashes. After the handle had broken off, the stub was ground down, leaving a small bowl. The vessel walls average 0.4 cm. in thickness.

This dipper came from a late Pueblo III deposit. Of Pueblo II manufacture, it was probably salvaged for use as a small saucer or as temper for new pottery. Large sherds were sometimes used as utensils, and ground potsherds were the non-plastic tempering material most preferred by Mug House potters.

Chapin Gray Bowl

The rubble fill in the Kiva F ventilator shaft contained a complete and undamaged plain gray bowl of a style we would expect to find in a Pueblo I house rather than in a cliff dwelling. It is small (14 cm. in diameter), and represents the lower part of a sphere cut just below its maximum diameter. The rim tapers to a rounded lip. Vessel walls average 0.7 cm. thick. Neither the interior nor the exterior surface was slipped; scraping marks are visible and particles of the crushed rock temper project through both surfaces (fig. 217).

Here again, an obviously early vessel occurred in a later context. Chapin Gray bowls of this sort were probably made no later than early Pueblo II, about 300 years before the construction of Kiva F. The bowl could have been an heirloom, passed along through many generations. Or perhaps some inhabitant of Mug House encountered the bowl during excavation in or near an old house site on the mesa top. He could have been tilling farmland, collecting red dirt for plastering masonry walls, searching for sherds to use as pottery temper, or poking about in an old house for usable junk.

Historic Pueblo Indians employ in both secular and ceremonial activities various items found among the ruins of previously occupied buildings. Old stone arrow points impart "power" to fetishes because of their age. Could an old plainware bowl have been considered to have similar value? Its provenience reveals nothing definite. It could have been stored in the kiva, or it could have fallen into the kiva from the courtyard above.

217 Chapin Gray bowl.

Polychrome Bowl

Sherds of about two-thirds of a St. Johns Polychrome bowl were encountered in the upper Kiva F fill and the rubble surrounding the east side of the south tower (Room 76). Originally, this vessel must have rested on the courtyard floor between Kivas F and H, adjacent to the wall of the tower.

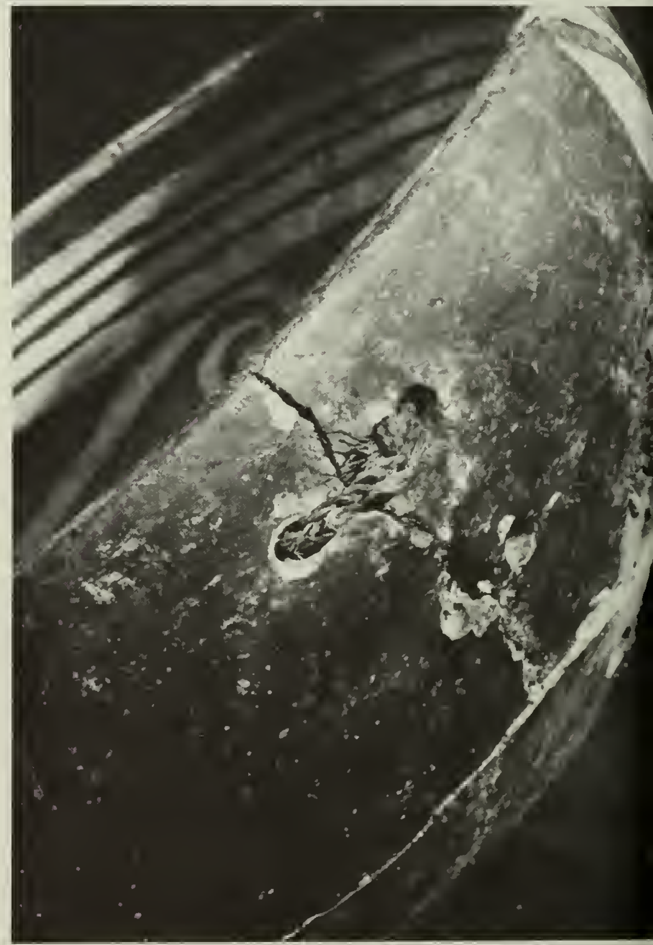
The fired clay body ranges from gray to orange in color, with faint traces of a carbon streak. It was tempered with crushed potsherds. A thick red slip, well polished, coated both the interior and exterior surfaces. The shape duplicates that of McElmo-Mesa Verde Black-on-white bowls, where the maximum diameter (21 cm.) is more than twice the height (9.5 cm.). Vessel walls average 0.5 cm. thick. The rim is essentially a vertical one, with a well-rounded lip that projects slightly on the exterior.

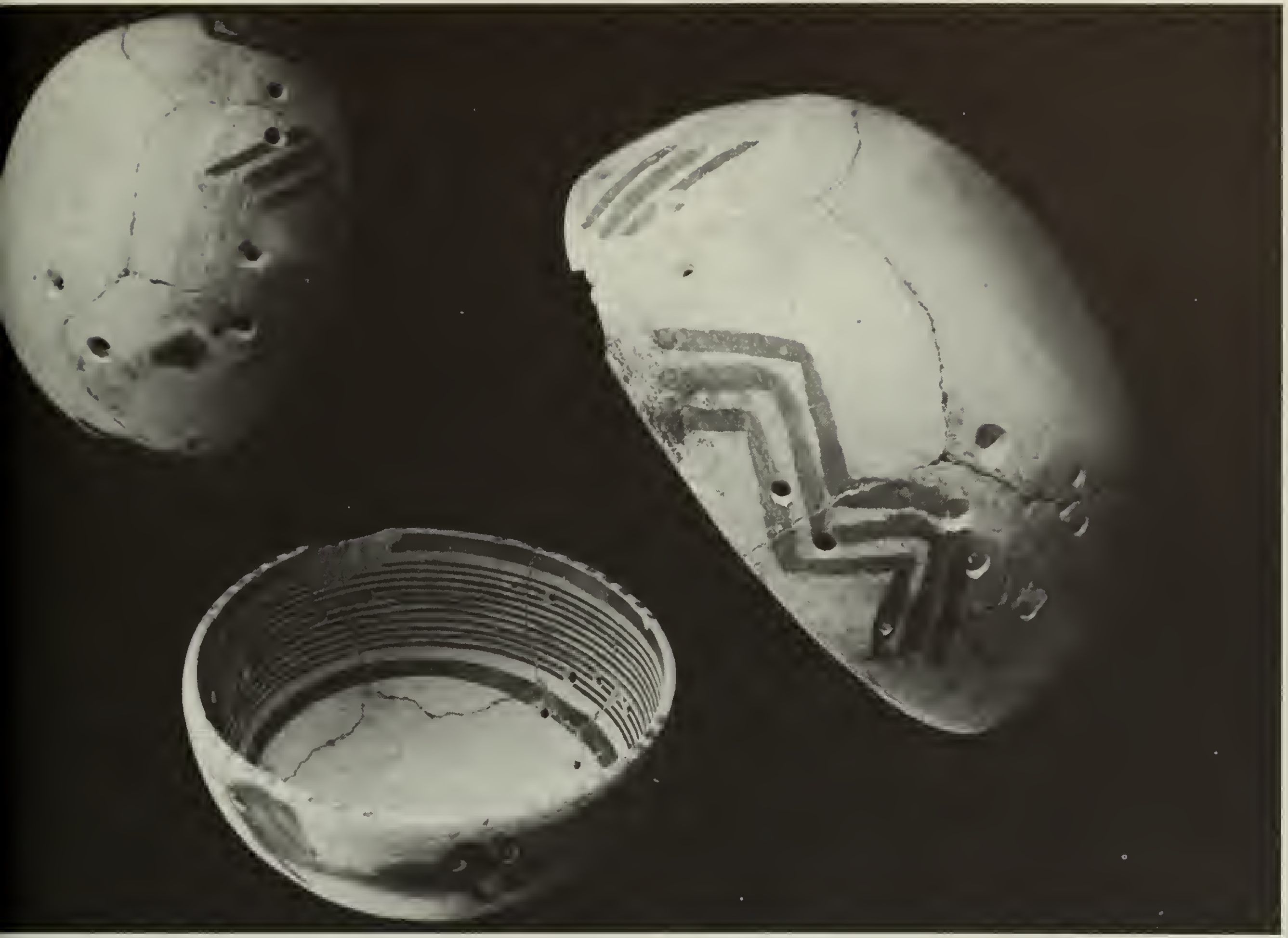
A band design of solid figures, executed in black organic paint, lines the vertical portion of the interior. The motif consists of an oblique line to which stepped triangles have been attached on opposite sides of the two ends, forming obtuse angled S's. The upper border is formed by three horizontal lines crossed by short lines to form a sort of net. A three-layered rectangular checkerboard bounds the lower side. In contrast, a 4-part centered star figure was painted in broad white lines on the exterior. Four triangular scrolls rise from four sides of a centrally placed circle and are outlined by two sets of heavy zigzag lines. No decoration was placed on the rim. Undoubtedly, this bowl was manufactured far from Mesa Verde and was acquired by trade.

Repair of Broken Vessels

Whether for sentimental reasons or economy, the Muguenos frequently mended broken pots. The usual procedure was to drill small holes in pairs on either side of the break, and then to draw the pieces together with

218 Mesa Verde Black-on-white bowl mended with original length of yucca twine.





219 Three views of a Mesa Verde Black-on-white bowl with nine pairs of mend holes.

twine or yucca strips (fig. 218). If the pots were to hold liquid, the seams could be sealed with pinyon pitch. Pinyon pitch has been seen only on corrugated jars from Mug House.

It is interesting to note that whereas only 4 out of 129 (3 percent) corrugated jars have mend holes, 2 of 27 (7.5 percent) McElmo Black-on-white bowls and 20 of 136 (15 percent) Mesa Verde Black-on-white bowls were so mended. Of this last group, one contains nine pairs of mend holes (fig. 219). The only other pots on which mend holes were observed are a McElmo Black-on-white water jar and a Mancos Black-on-white dipper. Mend holes are common in sherds. There appears to have been some differential value placed on the various kinds of pottery vessels.

POTSHERDS

The importance of potsherds is somewhat diminished in an assemblage containing a large series of whole and restorable pots. Thus the 50,000 sherds collected in our excavations at Mug House convey less information than the 339 complete or nearly complete vessels we recovered from the ruin. But in several respects the sherds amplify the data furnished by the pots. Certain features—for example, painting on the interior rims of corrugated jars and mineral paint on McElmo-Mesa Verde Black-on-white pottery—show up in higher frequencies in the sherds than in the whole pots simply because of the greater number of vessels represented by the sherds.

The sherds supply information in two other respects. The several stratified refuse deposits at Mug House contained many sherds but few restorable vessels, and hence the sherds were the keys to the occupational sequence, as discussed in ch. 1. Secondly, where so many sherds and pots occur together, it is possible to estimate the number of whole vessels manufactured at Mug House.

Every archeologist is aware that different kinds of vessels tend to break up into a greater or lesser number of sherds because of their size, shape, or technique of manufacture. There is variation between any two pots of the same size, shape, and quality of differing conditions of preservation. It should be possible to evaluate the relative sherd counts in terms of the average number of sherds in each kind of restored vessel.

Corrugated jars illustrate some of the basic problems. They comprise 28.8 percent of all whole and restorable vessels, yet corrugated jar sherds account for 64.4 percent of all potsherds. Undoubtedly, the greater difficulty in recognizing pieces of a particular corrugated jar and in matching them is responsible for some of this seeming paradox. Still, the vessel size and its relative fragility are the prime factors. The average number of sherds counted and estimated for 98 corrugated jars of all sizes is about 138 per jar. Divided into the total number of corrugated sherds from Mug House (table 22), this figure would

TABLE 20.—ESTIMATED TOTAL VESSEL COUNTS

Vessels	Whole and restorable vessels		Vessels represented by sherds	Total probable vessels	
Corrugated jars	129	(29%)	225	354	(37%)
McElmo-Mesa Verde Black-on-white bowls	170	(38%)	170	340	(36%)
McElmo-Mesa Verde B/W dippers	34	(8%)	17	51	(5%)
McElmo-Mesa Verde B/W mugs	29	(7%)	6	35	(4%)
McElmo-Mesa Verde B/W pitchers	2		1	3	
McElmo-Mesa Verde B/W canteens	3	(13%)	44	103	(11%)
McElmo-Mesa Verde B/W seed jars	2				
McElmo-Mesa Verde B/W kiva jars	29				
McElmo-Mesa Verde B/W water jars	21				
McElmo-Mesa Verde B/W misc. jars	4				
Undecorated White Ware	18	(4%)	5	23	(2%)
Mancos Black-on-white	4		24	28	(3%)
Cortez Black-on-white	1		2	3	
Chapin Gray	1		5	6	
Polychrome	1		....	1	
Mancos Gray	....		1	1	
Totals	448		500	948	

indicate that about 225 jars were represented by the 31,150 corrugated sherds. The revised total of corrugated jars comprises 37.3 percent of an estimated total of 948 vessels (table 20).

The revised proportion of corrugated jars is much closer to the proportion of actually recovered pots than to the sherd counts. What discrepancy there is (8.5 percent) probably reflects the aforementioned difficulties of restoration in the laboratory. The remaining 27.1 percent difference from the sherd count proportion can only be explained by the number of differences in size, shape, and relative fragility.

The variable of size can also be observed in the corrugated jars. Fifty-one large jars average about 175 sherds, 25 medium jars about 94, and 13 small jars about 59 per vessel.

Shape becomes a factor primarily as it affects size, but it is particularly important in bowls and jars. The average sherd counts for black-on-white bowls are almost exactly one-half of those of black-on-white jars of the same diameter. Of course, the jars are also about twice as tall as the bowls. The average sherd counts, plus the estimated missing parts for the various kinds of pots in the Mug House collection, are as follows:

98	corrugated jars, all sizes	138
51	large corrugated jars	176
25	medium corrugated jars	94
13	small corrugated jars	59
160	McElmo-Mesa Verde Black-on-white bowls	50
85	large McElmo-Mesa Verde Black-on-white bowls	66
71	medium McElmo-Mesa Verde Black-on-white bowls	32
34	McElmo-Mesa Verde Black-on-white dippers	18
19	McElmo-Mesa Verde Black-on-white mugs	23
26	McElmo-Mesa Verde Black-on-white kiva jars	79
19	McElmo-Mesa Verde Black-on-white water jars	153
52	McElmo-Mesa Verde Black-on-white jars, canteens, etc	104

By applying these average estimates to the total sherd counts—taking into account also many unclassified sherds—and adding the resulting estimated numbers of vessels to the actual numbers of restored pots, it is possible to arrive at a rough picture of the relative numbers and importance of each kind of vessel (table 20).

It is immediately apparent that corrugated jars and black-on-white bowls far outnumber all other kinds. Each comprises more than one-third of all vessels. Black-on-white dippers and kiva jars each account for about 5.5 percent, while water jars and mugs account for about 3.5 percent each.

According to type, McElmo-Mesa Verde Black-on-white vessels make up 56 percent of the estimated total as opposed to about 37 percent of Mesa Verde Corrugated. Undecorated white ware makes up only about 2.5 percent. The remaining 4.5 percent consists of types from the two earlier components in Mug House cave: mostly Mancos Black-on-white, Mancos Corrugated, and Chapin Gray.

TABLE 21.—TOTAL COUNTS OF McELMO-MESA VERDE BLACK-ON-WHITE SHERDS

Sherds	Bowl	Dipper	Mug	Jar	Kiva jar	Seed jar	Canteen	Pitcher	Totals
Mesa Verde Black-on-white	3, 093	85	87	455	25	....	1	....	3. 746
Mesa Verde B/W: unslipped	62	1	2	12	2	....	....	....	79
Mesa Verde B/W: mineral paint	9	....	....	....	....	....	....	....	9
Mesa Verde B/W: exterior rim fillet	1	....	....	....	....	....	....	....	1
McElmo Black-on-white	683	55	12	169	1	3	1	1	925
McElmo B/W: unslipped	139	5	....	23	....	....	....	....	167
McElmo B/W: tapered rim	11	....	....	....	....	....	....	....	11
McElmo B/W: exterior-corrugated	22	....	....	....	....	....	....	....	22
McElmo B/W: mineral paint	5	....	....	....	....	....	....	....	5
Indeterminate	2, 545	103	43	1, 267	26	....	....	....	3, 984
Totals	6, 570	249	144	1, 926	54	3	2	1	8, 949

Counts of all the potsherds found in Mug House are given in tables 21 to 24. The great deal of disturbance in the site, due both to the collapse of buildings and to previous digging, has destroyed the potential value of separate determinations by structure. Furthermore, I am convinced it is sometimes unwise to base interpretations on sherd counts. They certainly give a distorted view of the relative importance of various kinds of pottery found in Mug House.

The tables of total sherd counts are primarily useful in completing the description of Mug House pottery, already told mostly by the complete pots. For example, it is possible to see that mineral paint does occur on McElmo-Mesa Verde Black-on-white, although very rarely. The proportion of slipped surfaces increases noticeably from McElmo to Mesa Verde Black-on-white, but unslipped surfaces may be expected on sherds of both. Tapered rims and exterior corrugation, both common in Mancos Black-on-white, occur now and then on sherds of McElmo Black-on-white. The large proportion of indeterminate sherds (44.5 percent) clearly belongs to the combined McElmo-Mesa Verde Black-on-white pottery type, although the sherds cannot be differentiated between the McElmo and Mesa Verde poles within the type. Under conventional classification, where McElmo and Mesa Verde Black-on-whites are considered separate types, these sherds are simply unclassified and further distort the picture obtainable from sherd counts.

A similar situation exists with the corrugated sherds (table 22). Eighty-eight percent of all corrugated sherds do not exhibit characters distinctive enough for separation into Mancos or Mesa Verde Corrugated. They can, of course, be called unclassified sherds of Mesa Verde Gray Ware. But I believe a more realistic approach would recognize a Mancos-Mesa Verde Corrugated pottery type, with two varieties that are differentiated primarily by vessel shape. Thus 27,379 corrugated sherds could at least be relegated to this type even though they could not be separated into one or the other of the two varieties.

The large number of unclassified sherds deserves comment. To designate a sherd as coming from the unpainted portion of a black-on-white pot requires subjective judgment. However, all of these sherds duplicated in every way, except for the presence of paint, the attributes of black-on-white painted sherds, and we know from the complete vessels that considerable portions of painted pots were left unpainted. What we do not know is how many really came from undecorated white vessels. I would doubt that very many did, since

TABLE 22.—TOTAL COUNTS OF CORRUGATED SHERDS

Mesa Verde Corrugated	2,872
Mesa Verde Corrugated: patterned surface	218
Mesa Verde Corrugated: corrugated rim	207
Mancos Corrugated	372
Mancos Corrugated: patterned surface	24
Mancos Corrugated: impressed surface	18
Mancos Corrugated: diagonal-ridged surface	51
Mancos Corrugated: diagonal finger-ridged surface	9
Indeterminate patterned corrugated	151
Indeterminate corrugated	27,228
Total	31,150

TABLE 23.—TOTAL COUNTS OF NON-CORRUGATED UTILITY WARE SHERDS

Sherds	Bowl	Jar	Totals
Mancos Gray		32	32
Chapin Gray	1	16	17
Moccasin Gray		3	3
Mummy Lake Gray		18	18
Indeterminate plain gray body sherds		593	593
Totals	1	662	663

TABLE 24.—TOTAL COUNTS OF SHERDS OF ALL OTHER POTTERY TYPES

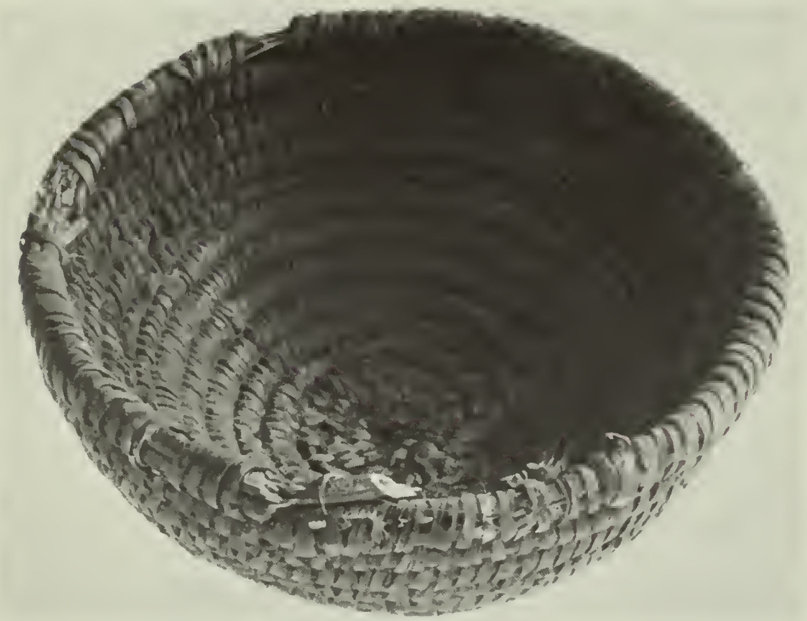
Sherds	Bowl	Dipper	Mug or pitcher	Jar	Canteen	Seed jar	Kiva jar	Totals
Mancos Black-on-white	485	29	2	454	3			973
Mancos B/W: unslipped	73	7		95				175
Mancos B/W: exterior-corrugated	56							56
Mancos B/W: ticked rim	21							21
Mancos B/W: organic paint	158	5		33				196
Cortez Black-on-white	36	2		14		1		53
Cortez B/W: unslipped						4		4
Chapin Black-on-white	3							3
La Plata Black-on-red				1				1
Abajo Red-on-orange	1							1
Unclassified: plain sherds from B/W pots	1,914	68	5	2,585			21	4,593
Unclass.: "undecorated white ware"	128	8	2	1			1	140
Unclass.: plain	52	10		193				255
Unclass.: corrugated				52				52
Unclass.: black-on-white	246	26	1	259				532
Unclass.: black-on-red	3							3
Unclass.: miscellaneous	25	2	1	548				576
Totals	3,021	157	11	4,235	3	5	22	7,634

only 4 percent of the complete pots belonged to this type. The plain and corrugated sherds could not be satisfactorily assigned even to wares because of poor condition or small size. Very small or severely eroded sherds were discarded without being counted.

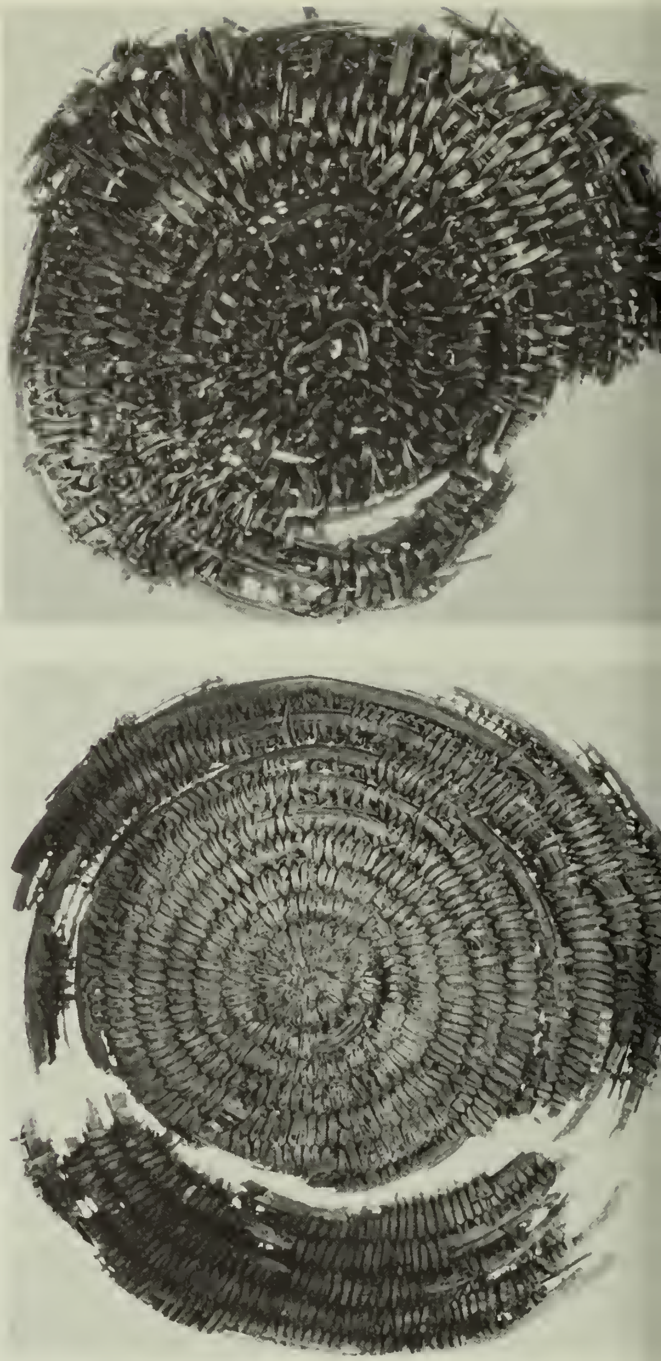
Although vessel shapes are included in the tables, they do not reflect the proportions of each shape among the complete pots. The figures only tell how many rim sherds of each of the less common shapes were found. Bowl sherds can be differentiated from jar sherds by the treatment of the interior surface, but a fragment of a kiva jar cannot be distinguished from that of a water jar or canteen unless part of the rim or neck is present.

BASKETS

Coiled Baskets. One whole coiled basket and fragments of four similar specimens are all that remained after the earlier explorations of Mug House. The complete basket is small and hemispherical, 12.5 cm. in diameter and 5 cm. in height (fig. 220). The two larger fragments represent possible basket trays with flat bottoms, exceeding 13 cm. in diameter (fig. 221).



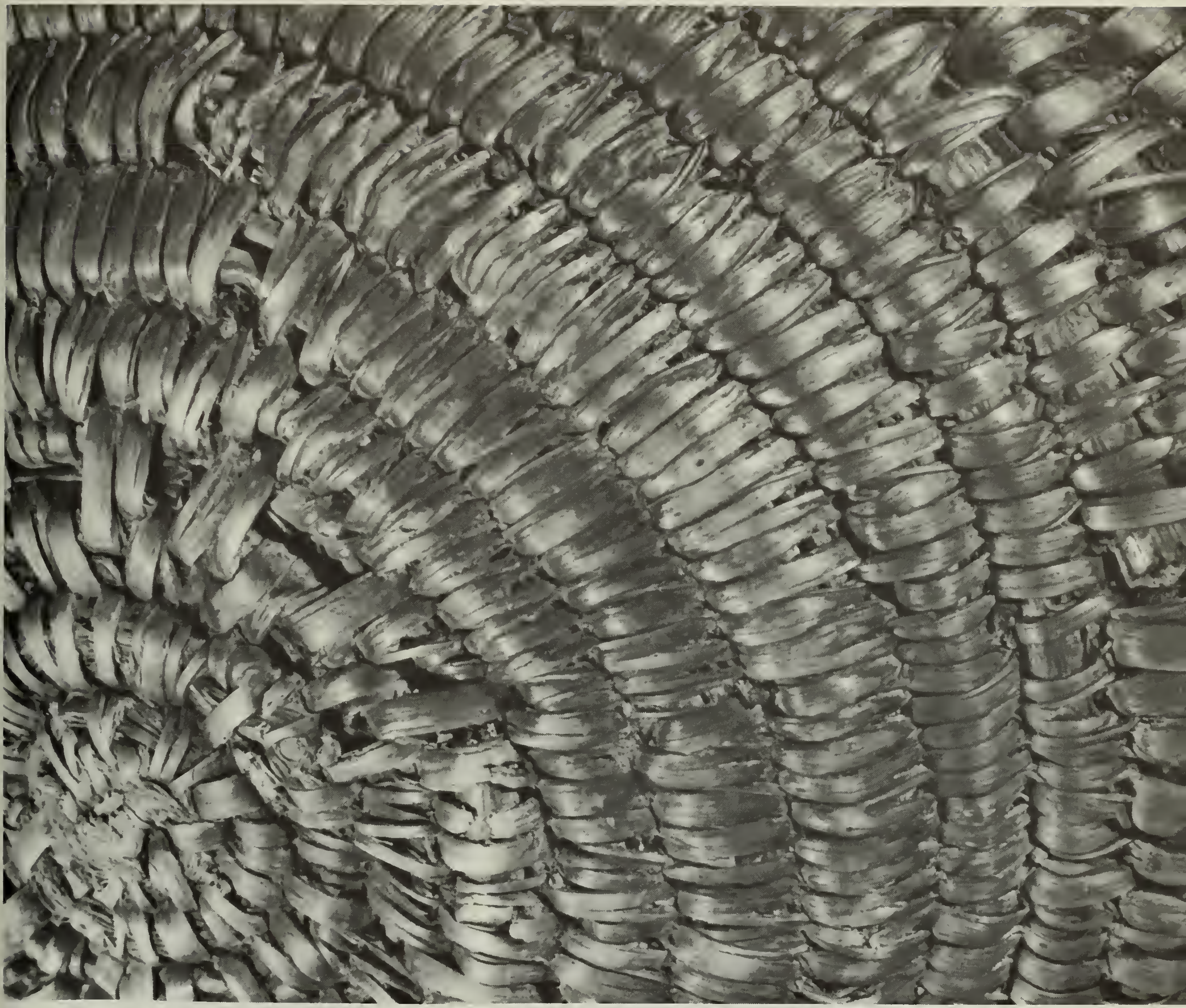
220 Small coiled basket from Room 44 fill.



221 Two fragments of coiled basket trays (?).

Coiled baskets were made by forming one or more foundation elements into a spiral and attaching each successive row to the preceding one by simple loop stitching. In all five specimens, the foundation consisted of three rods, averaging about 0.3 cm. in diameter, with one resting on the tops of the other two. Most of these rods were willow, although a few were rabbitbrush. The stitching elements—strips of willow—passed over each new coil and through the topmost rod of the preceding coil. In most cases, each new stitch passed between two previous stitches on the row below, but occasionally one of them split an earlier stitch. In the only example of a rim, the topmost coil simply pinched out and no alteration was made in the ordinary stitching. All of the elements were of natural color.

There is a surprising range of quality in the stitching, even on a single specimen. Stitches in the first 10 coils of the complete basket were quite regularly spaced, about 6 per centimeter, and very few were split, but the last 5 coils were very carelessly stitched with slightly wider strips (fig. 222). These stitches average only four to the centimeter and are very irregularly spaced with many overlapping one another, and there is a higher incidence of splitting previous stitches. The sharp contrast in workmanship suggests that the basket was begun by one person and finished by another. A fragment of even cruder workmanship, with an average of only three stitches to the centimeter, was found in the same fill of Room 44 as the complete basket (fig. 221a). The other three basketry specimens, one from the fill of Room 39, another from refuse in Room 29 (fig. 221b), and the third from north of Kiva A, were quite regularly stitched,



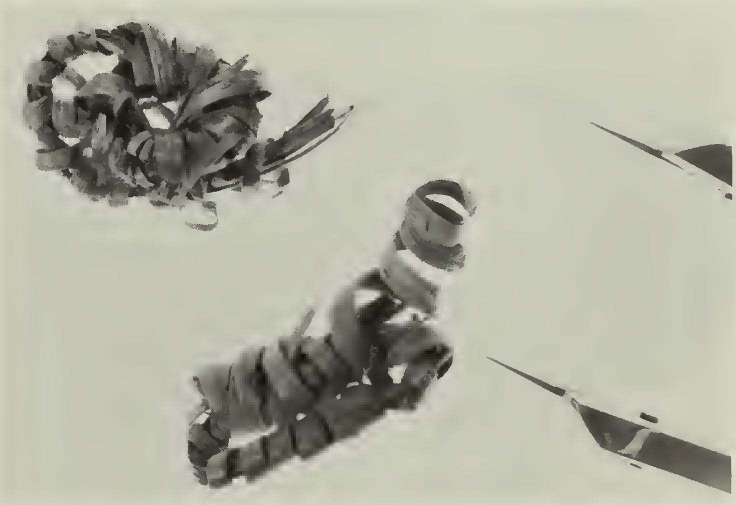
222 *Closeup of stitching in small coiled basket shown in fig. 220.*

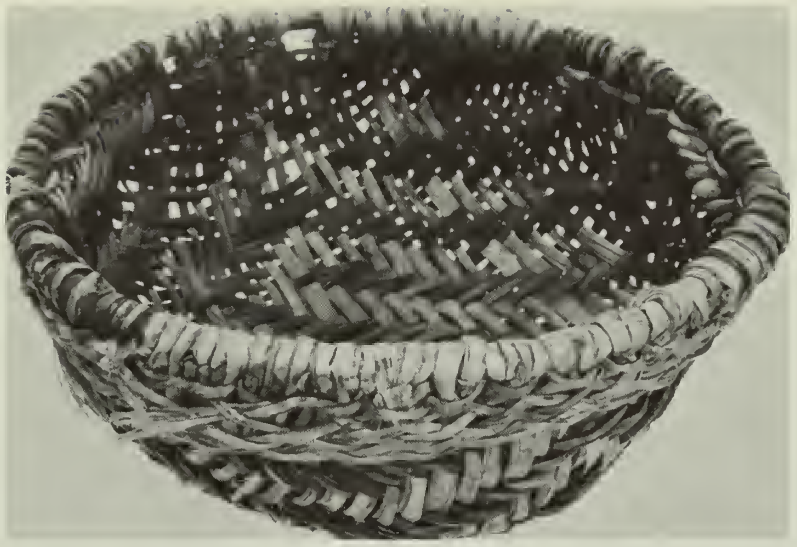
about five per centimeter.

The topmost level of Area VI yielded what appear to be the foundations of two coiled baskets (fig. 223). Neither had progressed far enough to see the turning of the first coil upon itself, but the materials and general technique were the same as in the larger fragments.

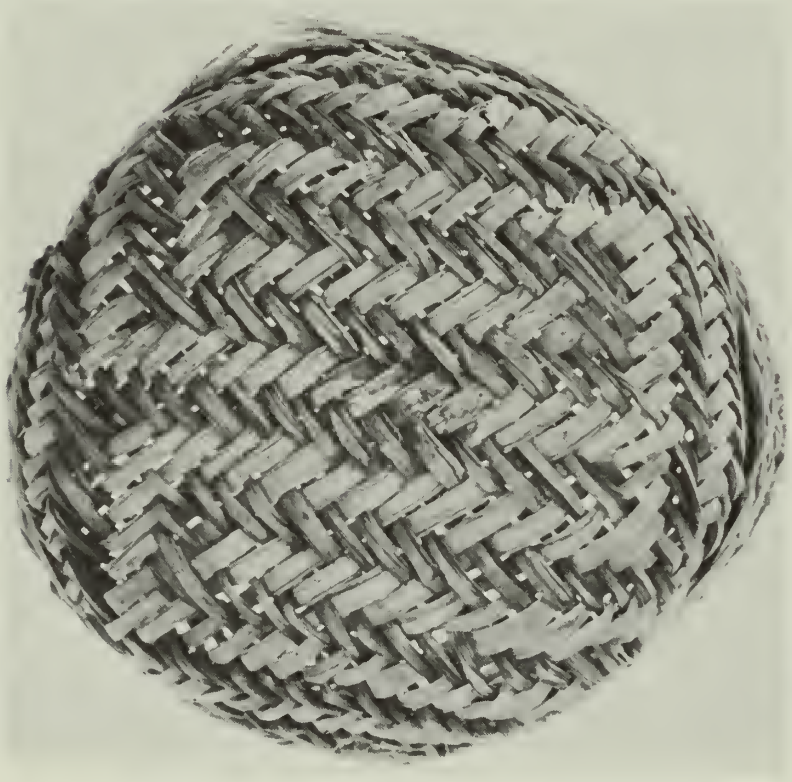
Twilled Ring Baskets. In the rubble in the northeast corner of Room 44/2, we uncovered an intact ring basket (figs. 224 and 225). A second specimen, with its wooden ring partly broken out (fig. 226), was found against the underside of a large Kiva E roof timber that was too big to fall very deeply into the kiva. Both baskets are small and bowl-shaped, the former measuring 15 cm. in diameter and 7 cm. in height, the latter 18 cm. in diameter and 5 cm. in height.

223 *Beginnings of coiled baskets. Divider points are 1 inch apart.*

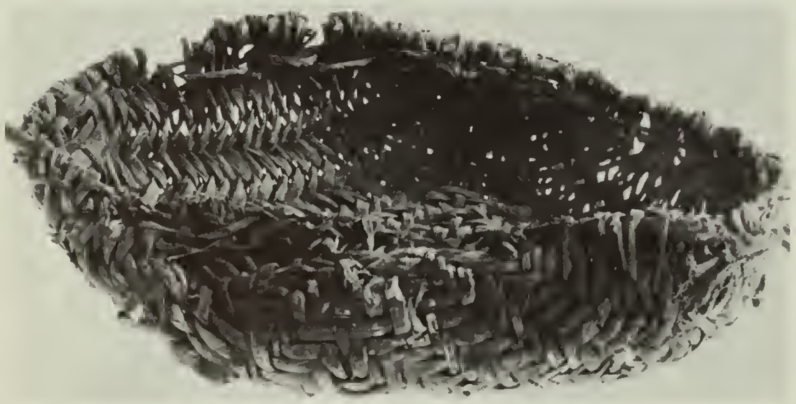




224 *Three-quarter view of small yucca ring basket from rubble in Room 44/2.*



225 *Bottom view of small yucca ring basket shown in fig. 224.*



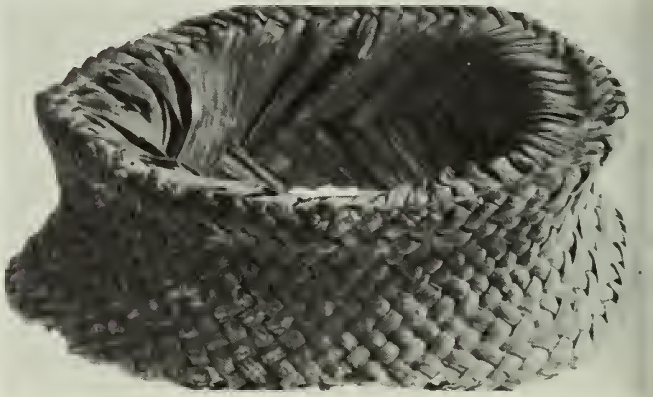
226 *Small yucca ring basket.*

In both cases, the strips of split yucca leaf, 3 to 5 cm. wide, were woven in an over-3 under-3 diamond twill, with the ends of half the strips passing over a ring made of an oak twig. The ends of the yucca strips were held in place by twining groups of three and four of them together, with additional yucca strips just beneath the oak hoop. On both baskets, a narrow plaited band (1.1 cm.) of yucca strips, just below the oak ring, covered the raw ends of the main elements and added a decorative touch. This plaited band was made by looping yucca strips through some of the basketry and twining elements, interweaving the two ends of each strip with similar ends from other strips, and finally tucking the ends under. In the basket from Kiva E, both ends of each yucca strip moved toward the left, while in the other basket the two ends moved in opposite directions.

Although only natural colors were used on the Kiva E basket, the basket from Room 42/2 carried a simple pattern formed by the use of black-dyed elements in one direction and natural-colored elements in the other.

POT RESTS

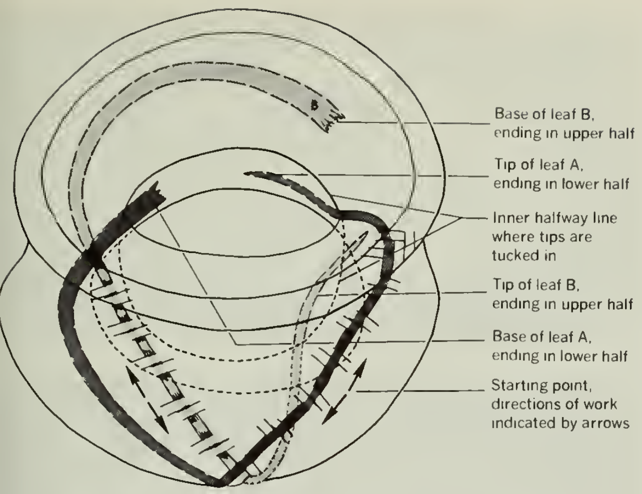
Woven Headrings. In the center of the floor of the small storage Room 75, we came upon a complete headring made from the whole leaves of narrow-leafed yucca (fig. 227). It resembles an automobile wheel without the tire. It measures 16.5 cm. in maximum diameter and 6.5 cm. in thickness. The surfaces are concave, presumably in order to fit the round bottom of a pottery jar and the top of an individual's head.



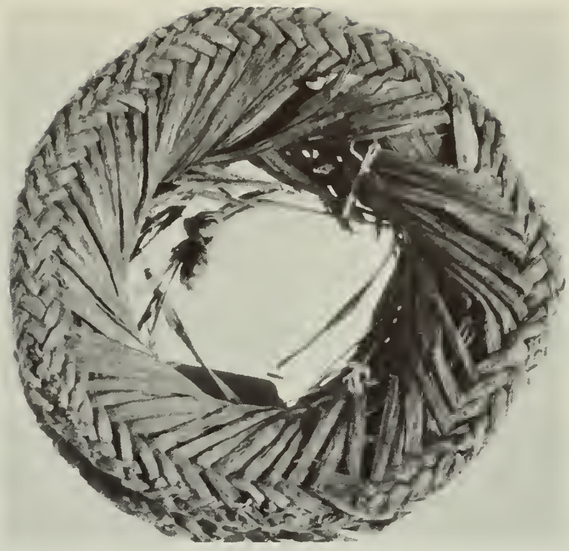
227 *Woven yucca headring from Room 75.*

One hundred and twenty-four complete leaves, each approximately 36 cm. long, were used in making this headring. About one-third of the basal ends comprise the bulk of the core. The leaves were interwoven in an over-2 under-2 twill to form the edges and exterior surface, and the sharp tips were tucked back into the central core (figs. 228 and 229). Since mature, narrow-leafed yucca plants commonly have as many as 120 usable leaves each, it is quite possible that a single plant furnished the material for this object.

Another headring from Mug House, constructed in the same way, is in the Wilmarth collection at the Colorado State Museum. It measures 12 cm. in diameter and only about 3 cm. thick. It appears to have been thoroughly compressed by use (fig. 229).


B
Base of leaf B, ending in upper half
Tip of leaf A, ending in lower half
Inner halfway line where tips are tucked in
Tip of leaf B, ending in upper half
Base of leaf A, ending in lower half
Starting point, directions of work indicated by arrows

228 *Diagram of weaving pattern in yucca headring shown in fig. 227.*

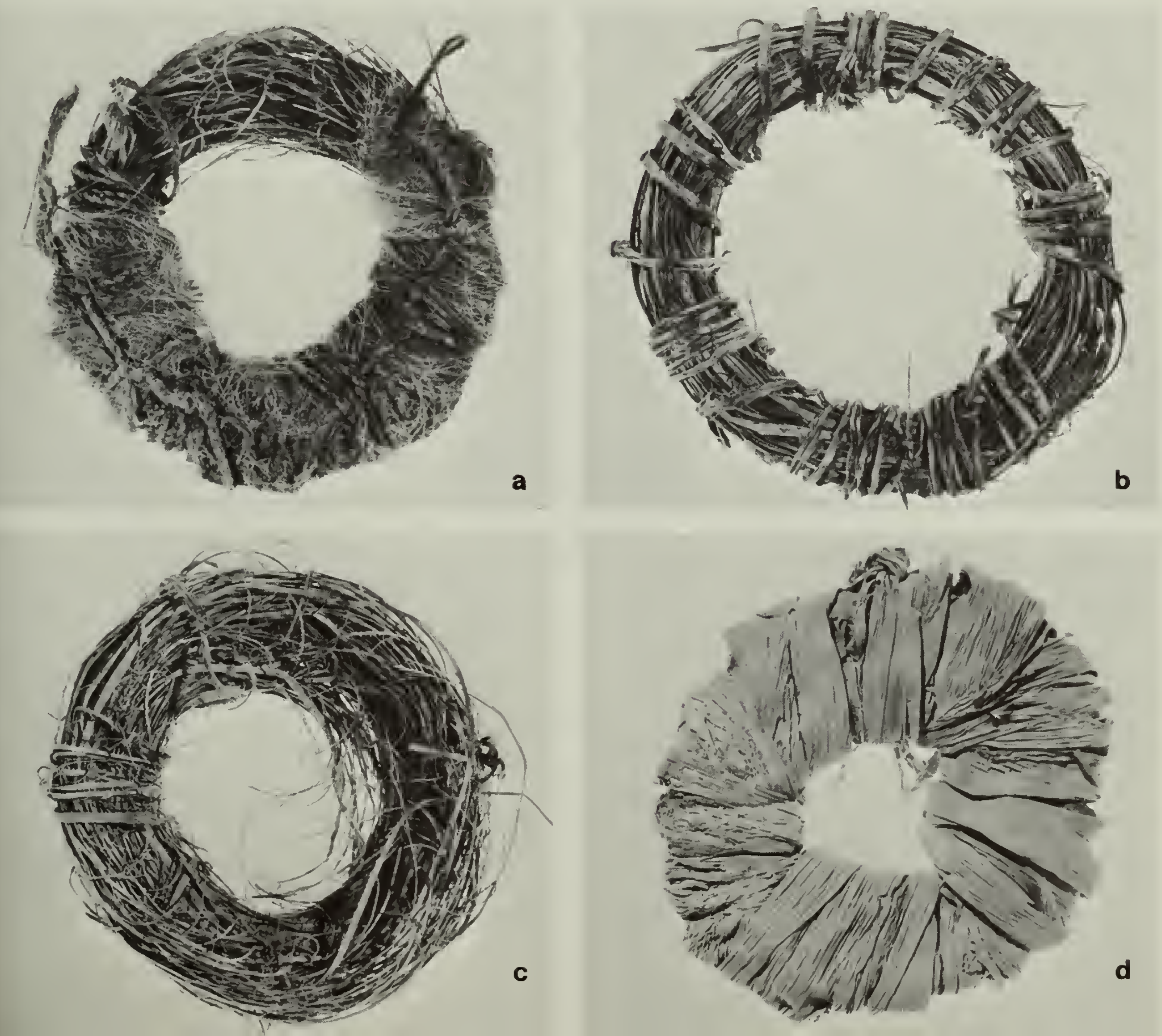


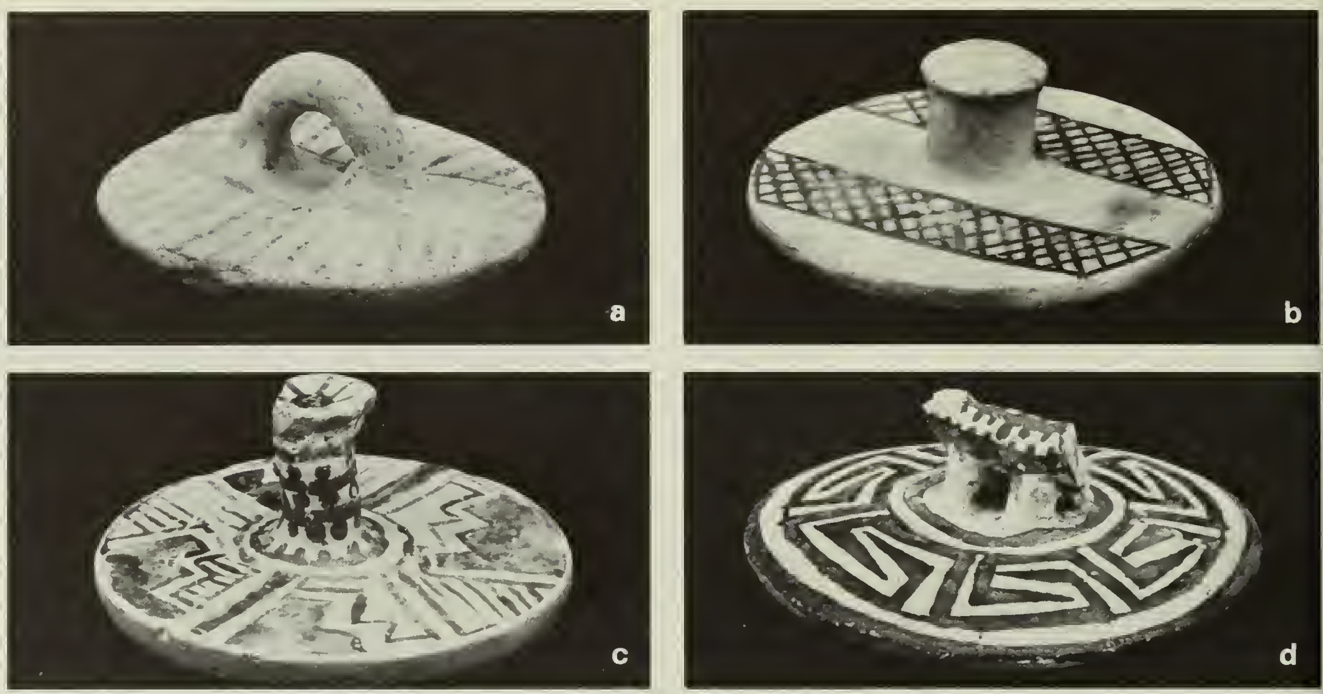
229 *Woven yucca headring from Mug House in Wilmarth collection, Colorado State Museum.*

Tied Bundles. Three doughnut-shaped bundles of split yucca leaves have been found in Mug House. Our excavations produced one from Area V. The other two were removed in 1935. The Area V specimen (fig. 230c) is the largest—26 cm. in diameter and 4.5 cm. thick—and retains on one side the impression of the bottom of a large jar. The bundle was fastened in four places with individual split yucca strips tied in square knots.

The second bundle, taken from the refuse immediately north of Kiva A, is wrapped intermittently with individual yucca strips also tied in square knots (fig. 230b). It measures 24 cm. in diameter and is less than 3 cm. thick. There is a slight concave impression on one side, with traces of soot that apparently rubbed off a corrugated jar. The third specimen, found on the surface, is considerably smaller—16.5 cm. in diameter and less

230 *Tied yucca bundles and wrapped cornhusk ring.*





231 Ceramic jar lids.

than 2.5 cm. thick. This bundle is fastened in two places with lengths of 2-ply Z-twist yucca twine, and is nearly covered with a wrapping of untwisted yucca fiber held by 2-ply Z-twist twine tied in a series of running half hitches on one surface (fig. 230a). The addition of padding and the small size—resembling the woven headrings—suggest that this piece was designed for use on top of the head rather than on the floor.

Three other jar rests are represented only by remnants of bundles. Two were under corrugated jars and the third marked the spot where a jar had once stood. One was originally about 23 cm. in diameter. Those from Area V and Courtyard B consist of split yucca leaves, but the scraps beneath the jar in Courtyard C are of unidentifiable grass. There is no doubt that these were the most common devices for accommodating the round bottoms of pottery vessels to flat floor surfaces.

Cornhusk Ring. This small bundle of cornhusks is spirally wrapped with other husks and fastened around the perimeter by pulling one end of each husk through another (fig. 230d). The specimen is only 12 cm. in diameter and less than 1.5 cm. in thickness. It came from Area V, and its small size suggests use on top of the head.

POT COVERS

Several kinds of lids or covers were made for pottery jars. Specially made ceramic lids seem to have been intended for use on the kiva jars. Other lids were made by carefully shaping potsherds or sandstone slabs to suitable sizes and shapes. In several cases, plugs of clay served to close jars.

Ceramic Jar Lids. Lids for kiva jars and perhaps other small-mouthed vessels were formed from clay as flat disks, with a handle affixed to the middle of one flat surface (fig. 231). They were painted and fired.

The nine whole and eight fragmentary ceramic lids are McElmo-Mesa Verde Black-on-white. Only two of them are unslipped. The designs, all in organic paint, duplicate those found on the pottery vessels (figs. 231 and 232 a–f). Layouts include both circular bands and panels. Decoration usually appears only on the handled surface. One lid is decorated on both surfaces (fig. 232b).

Jar lid handles are of three kinds—loop, knob, and effigy. Loop handles are merely thick ropes of clay attached at both ends (fig. 231a). One of the six examples had an ovoid cross section (fig. 232a). Three of these handles are broken off and the stubs are ground down. Knob handles look very much like the wooden knobs found on many present-day kitchen cabinets (fig. 231 b–c). Three of the five were broken off, but the stubs are not smoothed. Unfortunately, the single effigy figure is damaged: both the head and tail are broken off (fig. 231d). The animal represented may be a lizard or a small mammal with large, upright tail.

Eleven measurable lids range from 8 to 11 cm. in diameter. Usually they were fashioned to the appropriate size. Four of them, however, have been ground down around the perimeter, as if they were fitted after firing or were refitted for use on a smaller jar mouth. In two cases, the grinding has cut into the outer portions of the design (fig. 231 a, c). The diameters of the space in which these lids would have to fit—inside the raised rim of the kiva jars—range from 7.5 to 12.5 cm. Hence only the smallest kiva jars could not hold one of the lids.

Ceramic kiva jar lids were found in Rooms 9, 10, 22, 30, 37, 76, and 77; in the collapsed rubble of Kivas B, C, D, E, F, G, and H; and in the general trash. None were on kiva floors, and only one was directly associated with a kiva jar on the floor or Room 22. Otherwise, the distribution is much like that of the kiva jars.

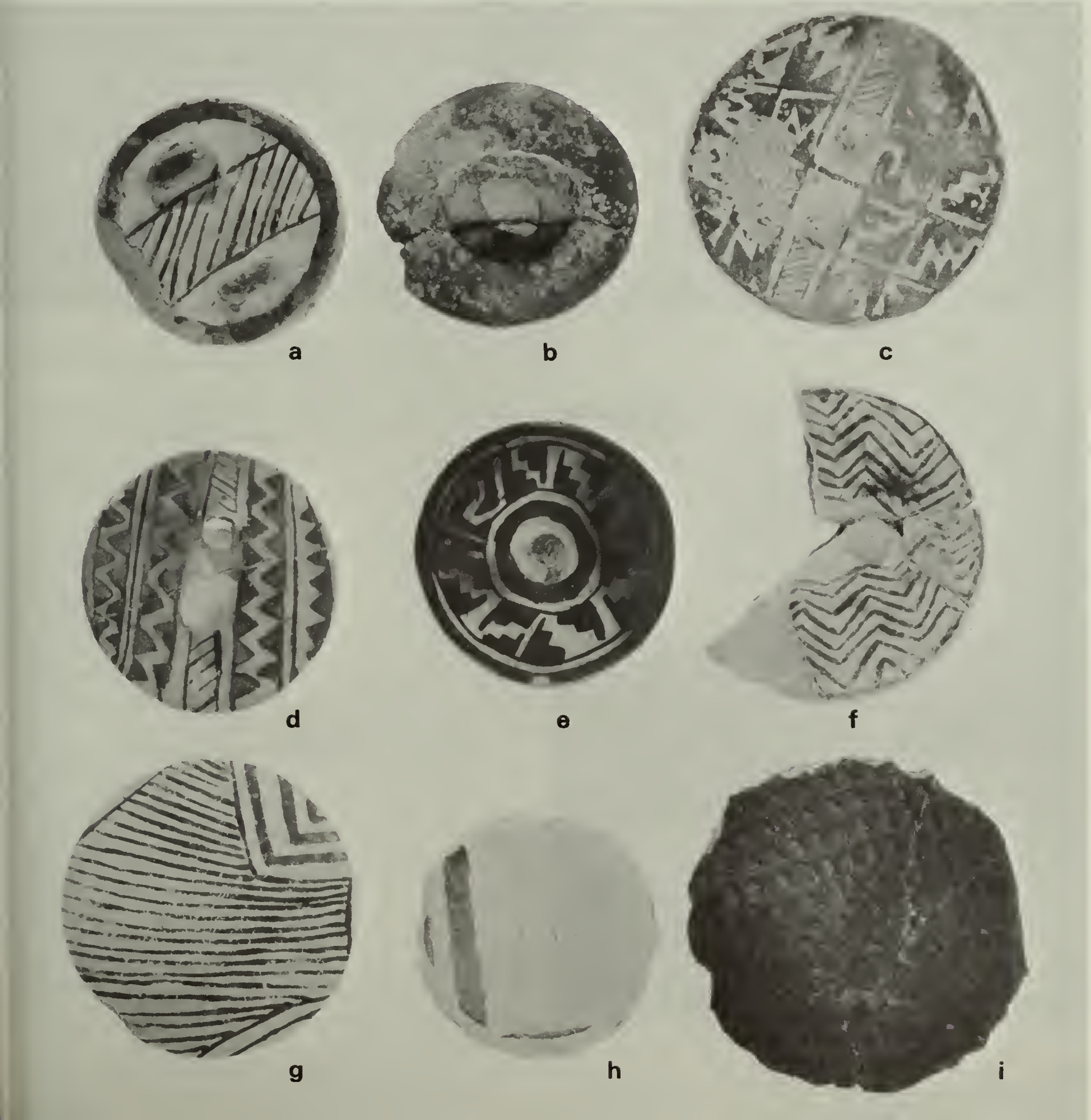
Sherds Worked Into Jar Lids. Another means of making a jar lid was to take a fragment from a broken pot and shape it to the desired form and size. The sherd was first reduced to the approximate size by breaking off small pieces around the perimeter. If a smoother finish was desired, the edge was ground down. Four of 11 specimens were chipped and 6 were ground. The other specimen was fashioned from the bottom of a mug by grinding off the stubs of the vertical walls. Three lids are body sherds of corrugated jars (fig. 232i), one is the painted section of a large water jar (fig. 232g), one is the indented bottom of a jar, and five are sherds of black-on-white bowls (fig. 232h). One of the last is the unpainted bottom of a bowl. It has three evenly spaced holes drilled around the perimeter, with a remnant of yucca cordage still in place in one of them. Diameters range from 7.5 to 11.5 cm. They could have been used on kiva jars in lieu of specifically wrought lids.

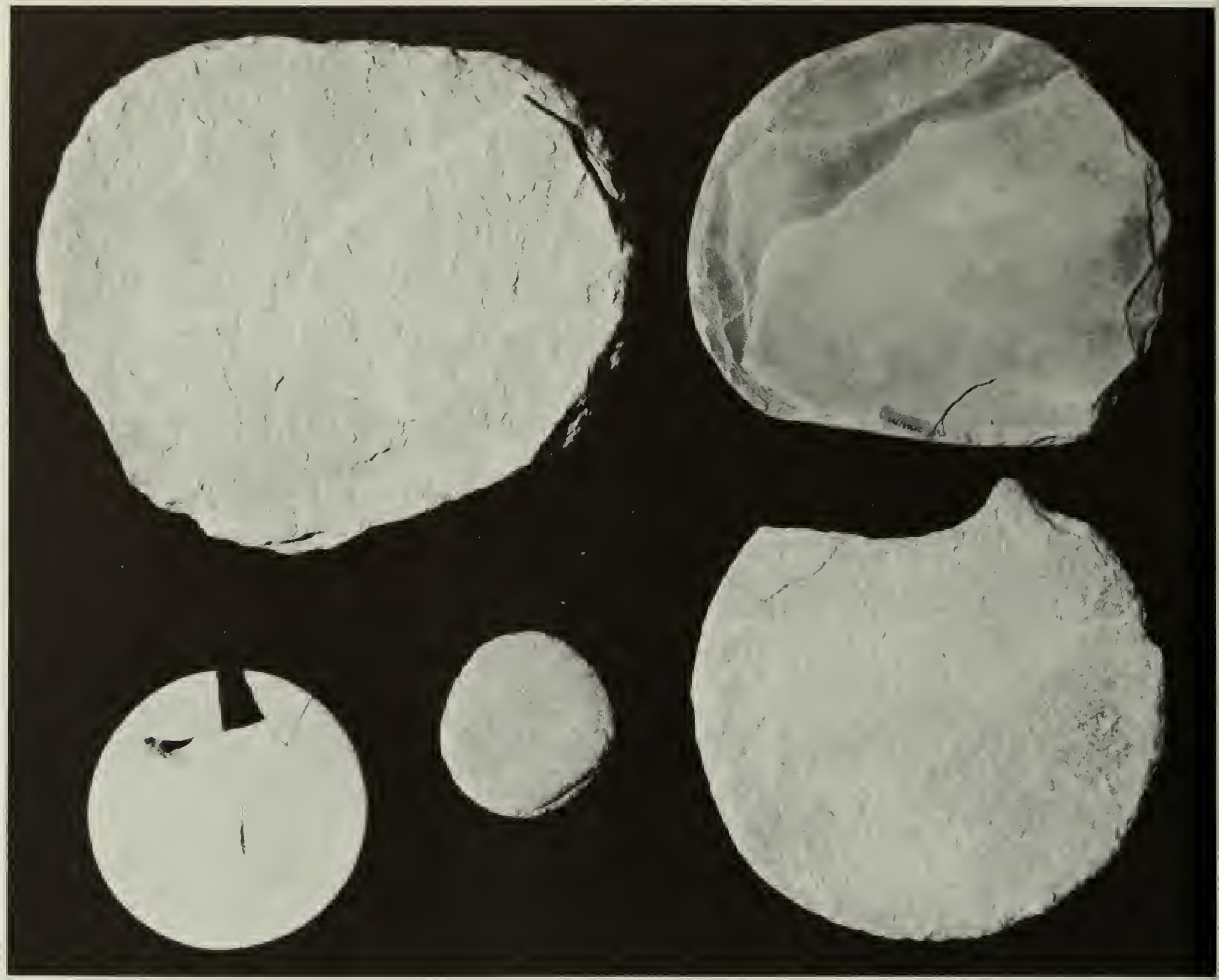
Sherds that had been reworked into jar lids came from Rooms 28, 40, 51, and 77; from the rubble accumulations in Kivas B and D; and from the trash deposits. The distribution corresponds with that of the ceramic jar lids and the kiva jars.

Sandstone Covers. Covers fashioned from sandstone slabs are necessarily heavier than the ceramic ones, and their size indicates most of them were intended for jars larger and stronger than the kiva jars. All or parts of 25 sandstone covers were collected from our excavations, excluding many tiny fragments that we discarded in the field. (Two whole covers were left in place over corrugated jars in Kivas A and E.) The three smallest measure 8, 11, and 12 cm. in diameter and 1.0, 1.1, and 0.8 cm. thick, respectively. All of these fit within the size and shape ranges of the ceramic lids and could have been used interchangeably with them. The 12-cm.-diameter cover, found in Room 76, is finely ground on every surface, including the steep bevel around its circumference (fig. 233, upper left). Grinding on the other two covers has not entirely obliterated traces of spalling.

The larger covers range from 15 to 39 cm. in diameter and from 1.0 to 2.5 cm. in thickness. They are all circular or subcircular in outline (fig. 233). Their edges were bifacially chipped and occasionally ground in part. One

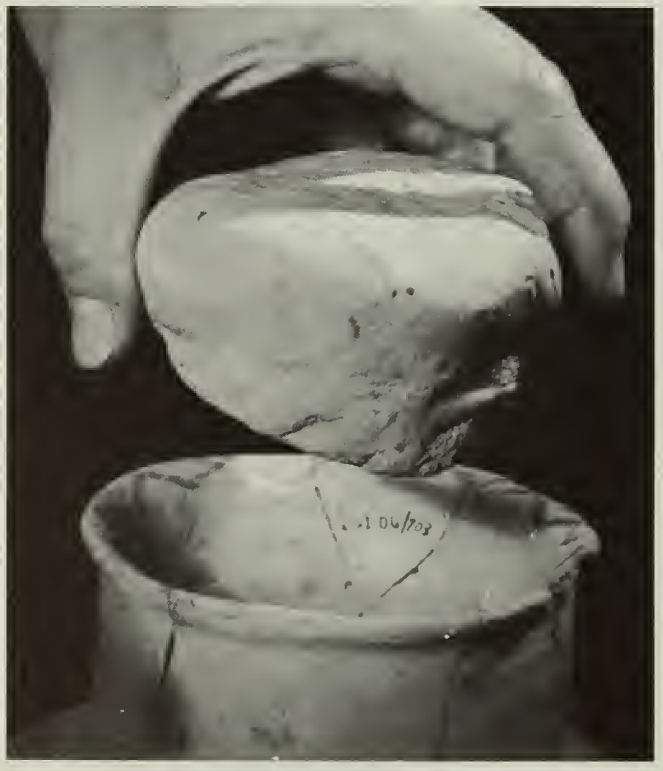
232 Ceramic jar lids, a–f, and potsherds reworked into jar lids, g–i.





233 Sandstone covers.

235 Adobe stopper.

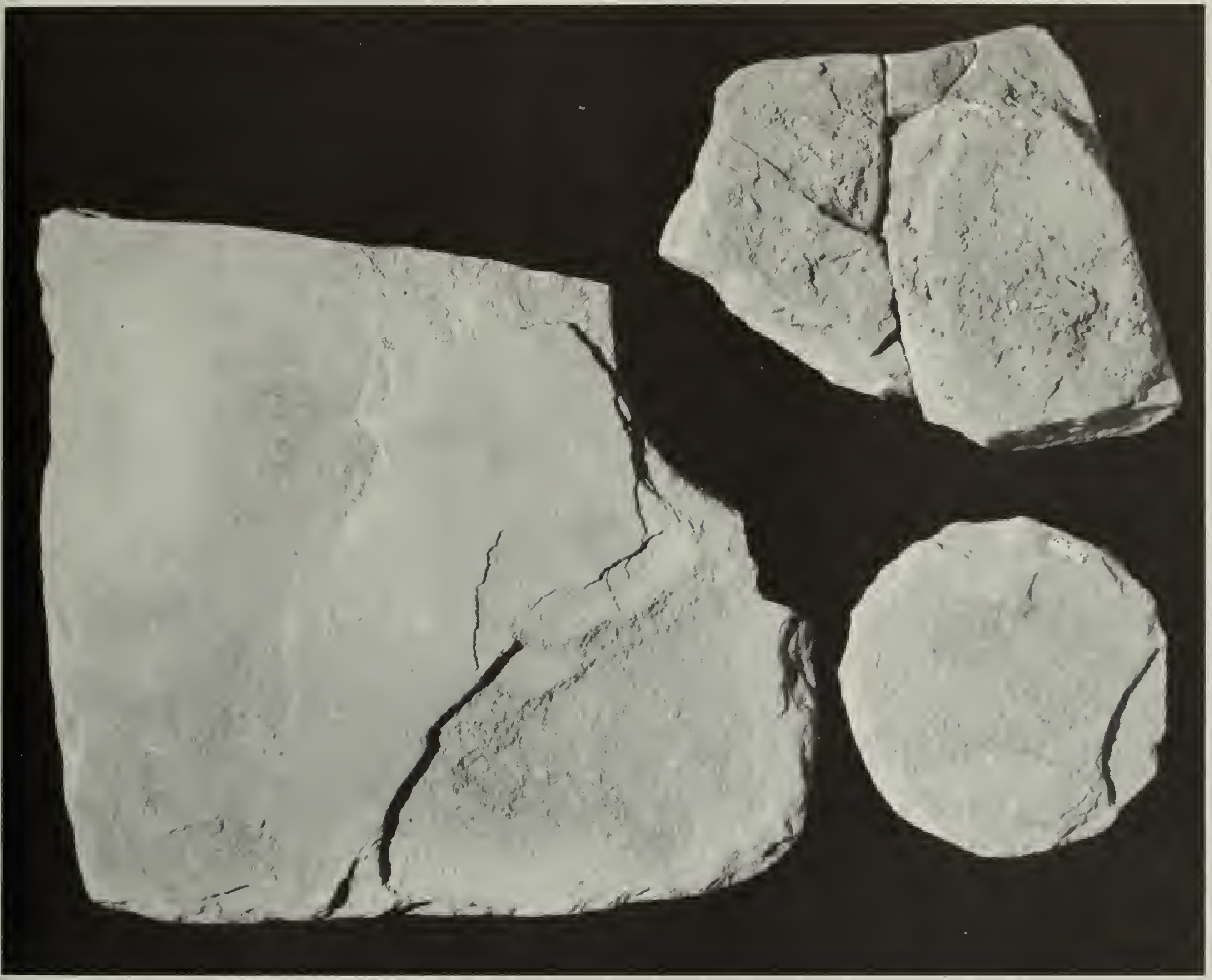


or both flat faces are unaltered, or they are pecked or ground, or they are both.

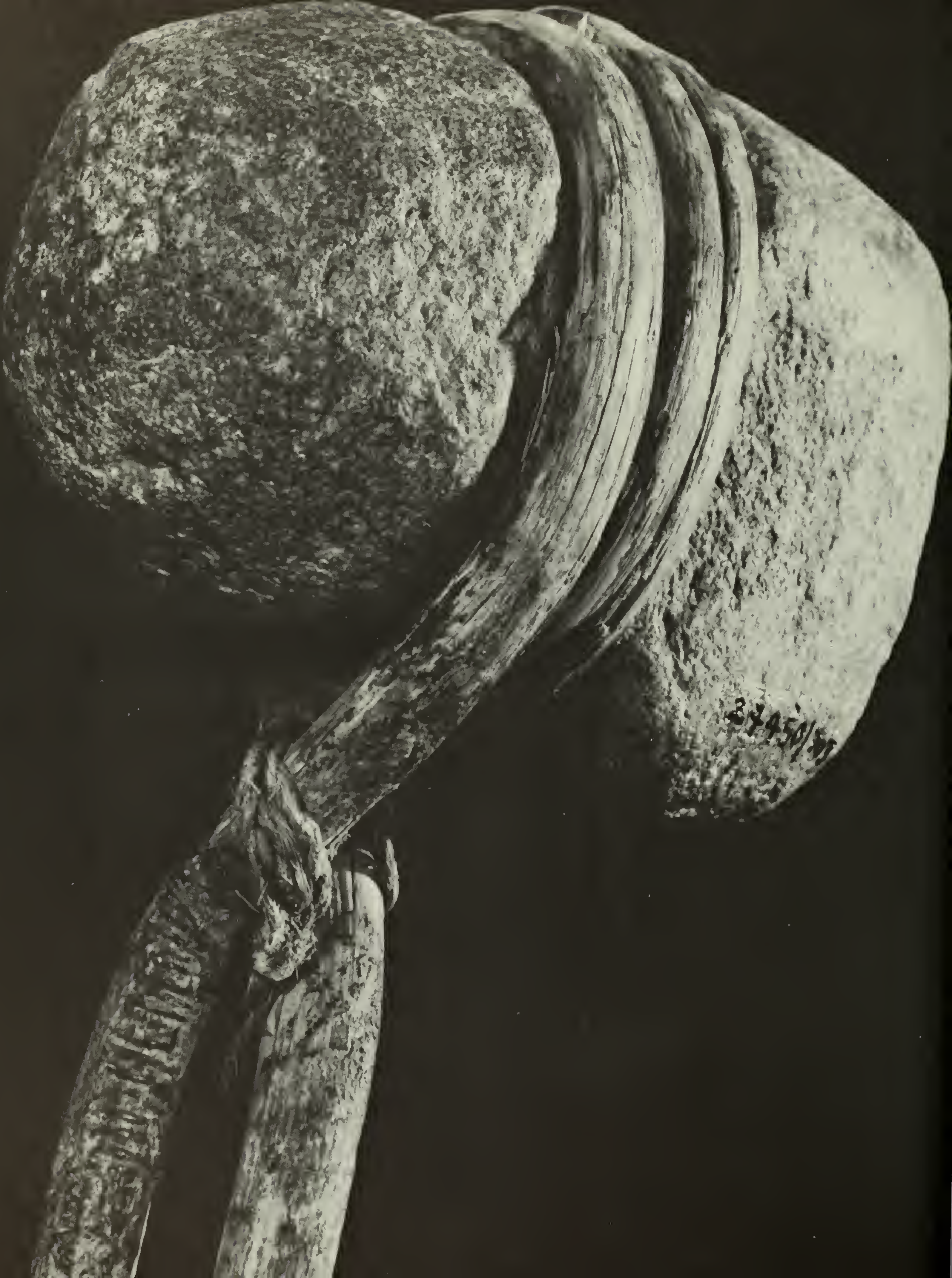
Four covers were found over the mouths of corrugated jars set beneath floors in Room 30 (fig. 234, lower left), in the corner of Courtyard A, in Kiva A, and in the recess of Kiva E. Many of the others were found close to corrugated jars.

Four other corrugated jars had less well-made sandstone coverings. In Room 71, one jar was covered with a large, thick sandstone slab and a crude mano, and another jar was covered with two slab fragments. In Area V, a jar was covered with a large worked sandstone slab (fig. 234, upper), and in Area VI a jar was sealed by an unworked chunk of soft sandstone set in damp mud (fig. 234, lower right).

Adobe Stoppers. Lumps of adobe, apparently wet enough to be plastic but dry enough to hold together, were sometimes used to seal narrow-mouthed jars (fig. 235). Once the mud dried, they could be removed and replaced without disturbing the perfect fit. Four such stoppers were found in Mug House—one each in Room 12, Room 26, Area V, and the rubble deposit filling Kiva E. The one in Room 26 fitted a large corrugated jar with a mouth measuring 19 by 21 cm. The other three would fit water jars or small corrugated jars with mouth diameters from 7.5 to 9.5 cm.



234 Sandstone covers found atop corrugated storage jars.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CHAPTER 9

tool kit

Included under the heading "tools" are those artifacts whose inferred functions facilitated the performance of manual operations. Of course the only tools that we can recognize are those which have been purposefully shaped or which show signs of wear. The following terminology and descriptions have been derived through a two-man analysis: I examined the artifacts from the standpoint of their role in the daily life of Mug House, and Richard P. Wheeler studied them according to technique and form, comparing the Mug House objects with those from other sites on Wetherhill Mesa.

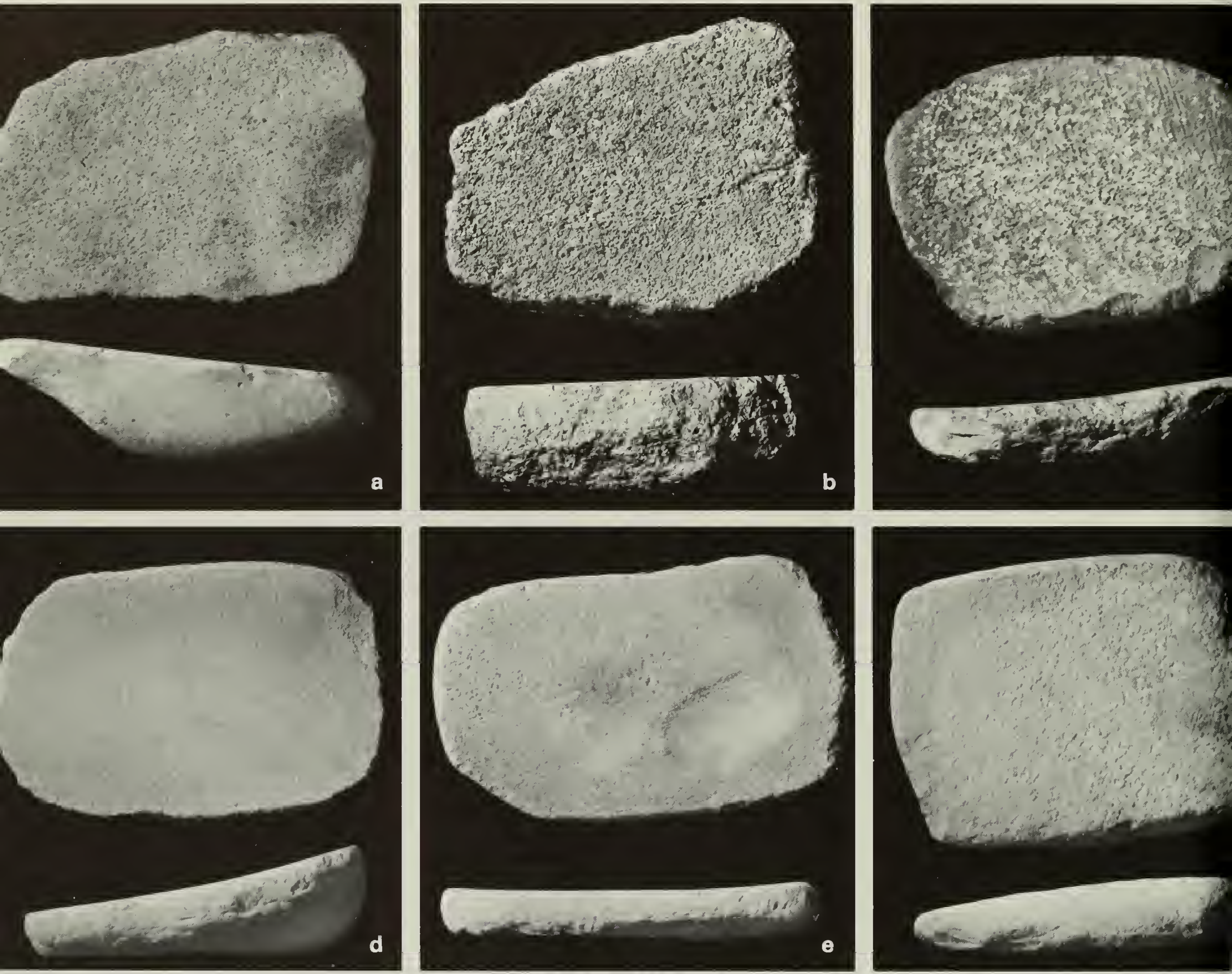
The tools are grouped according to broad functional categories such as grinding or cutting tools. Each of these broad categories encompasses specific classes such as manos, polishing stones, or axes, similar to those used by other Southwestern archeologists (notably Kidder, 1932, and Woodbury, 1954). In several cases we have felt it desirable to modify or restrict the definitions. Recurring variations in the classes are expressed as styles, which are designated by numerals or alphabetic (mnemonic) symbols. A style should not be considered synonymous with a type. It is simply a device for expressing consistently occurring clusters of attributes, and as such is quite sufficient for describing the assemblage from Mug House.

The inferred uses of the tools are regarded as more significant than the raw materials of which they are made; thus piercing tools of stone, bone, and wood are treated together.

GRINDING TOOLS

Metates. A total of 105 whole and fragmentary metates was found in Mug House (fig. 236). These are the large nether stones on which corn and other plant products were ground into meal or pulp beneath smaller stone implements, or manos, held in the hand. Each metate has a grinding surface formed by the backward and forward motion of the mano on a relatively large, flat face.

236 Some metates from Mug House.



237 Top and side views of five metates, a–e, and one metate blank, f.

The grinding surface covers one face on each of 104 specimens. These plain-faced or "slab" metates are either rectangular with rounded corners or ovate in outline. The grinding surface is always concave in long section and is usually convex or flat in cross section. About one-fifth of these metates are concave in cross section.

The same spalling technique used on building stones—that is, the removal of flakes or spalls unifacially by striking blows along the edge of the larger faces (fig. 237b)—was employed in shaping 69 metates. The edges on 26 others had been bifacially spalled (fig. 237c). The shaped edges on 85 metates were further dressed by pecking, in a few instances completely obliterating the signs of shaping. The spalled edges on 17 metates were not further dressed. Only one fragment lacked any sign of shaping or dressing.

On eight specimens, the spalling extended over part of the bottom face. Nine others had been slightly pecked and four had been partly ground on the bottom. Grinding on the edges was noted on only two metates.

There seem to be two substyles of plain-faced metates. One is relatively thin and slablike (fig. 237c–e); the other tends to be shorter, narrower, and blocklike (fig. 237a–b). Table 25 details the main differences between these substyles. Eighty-five percent of the slablike metates were manufactured from the local Mesaverde sandstone, while 75 percent of the blocklike metates were made from materials that had to be brought in. Most of these materials are coarser than the Mesaverde sandstone. The blockier metates are consistently more ovate in outline. Their greater thickness may have precluded the use of bifacial spalling during manufacture; a larger number of them lacked pecking on the edges; and none of the edges or bottom faces had been ground.

"Sharpening" of the grinding surface characterized 65 of the fine-grained Mesaverde sandstone specimens.

ABLE 25.—METATES AND METATE BLANKS

	Slabs (80)	Blocks (24)	Blanks (7)
aterials:			
Mesaverde sandstone	68	6	7
Conglomerate	5	8	....
Breccia	2	1	....
Other sandstone	5	6	....
Other materials	....	3	....
hapes:			
Rectangular with rounded corners	72	11	5
Ovate	2	10	....
Other	1	2	1
haping technique:			
Unifacial spalling	47	22	4
Bifacial spalling	26	1	2
Unmodified	1	....	1
dge dressing technique:			
Pecking	69	16	6
Grinding	2	....	....
ottom dressing technique:			
Spalling	3	5	....
Pecking	7	2	1
Grinding	4	....	1
verage dimensions:			
Length (cm.)	43. 3	38. 2	46. 4
Width (cm.)	28. 3	25. 6	30. 4
Thickness (cm.)	7. 6	11. 1	10. 4
Weight (gm.)	13, 571	14, 756	20, 912

hese surfaces have the same dimpled appearance as the ressed faces of building stones (fig. 237c), and they ere probably roughened with hammerstones in the ame manner. Apparently, continued use wore the rinding surfaces too smooth to be effective, and they ad to be periodically roughened. The coarser-grained tones did not require roughening.

Presumably the metates were fixed in a tilted position n slab-lined grinding bins, so that a worker could kneel ehind the high end and the fruits of her labor would all off the low end. Even though traces of 18 grinding ins were found throughout the ruin, none of them conained metates. All the metates were found loose on the urface, mixed in the general fill of rooms and kivas, nd occasionally on both room and kiva floors. Either he last Muguenos used metates outside grinding bins, r the remaining intact bins with their metates collapsed mong the general rubble of the ruin. We discovered no lues to account for the two substyles.

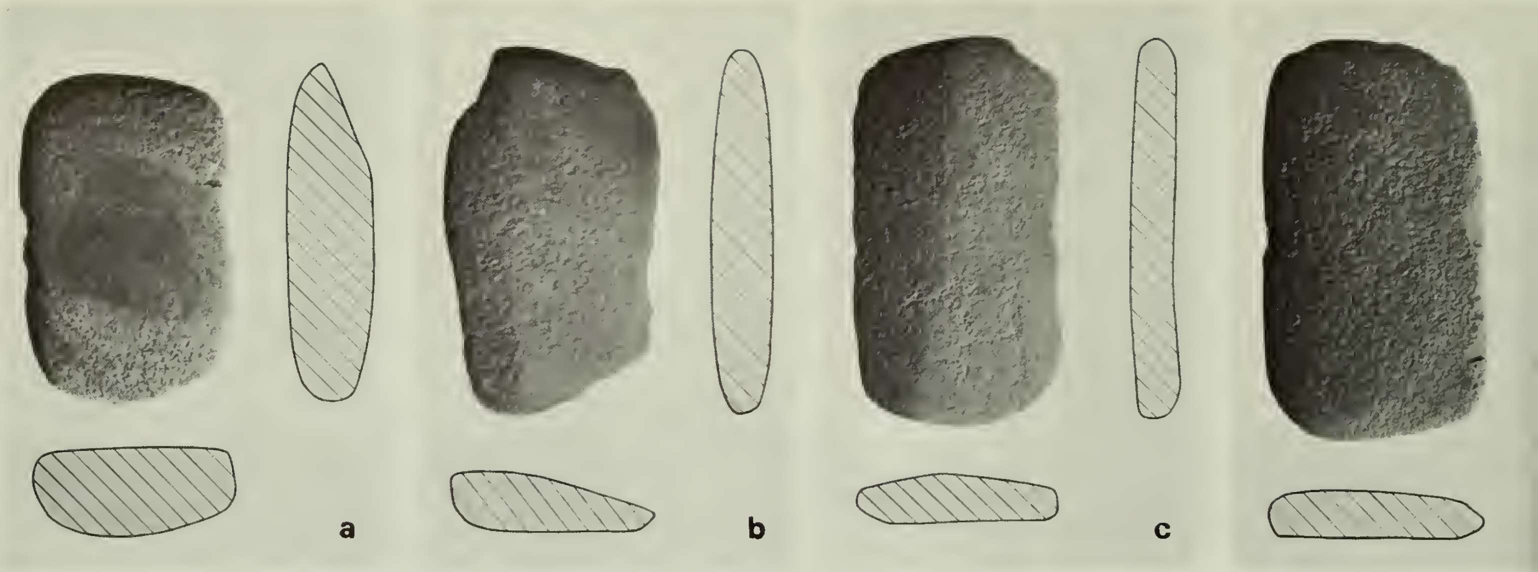
A single fragment of a troughed metate was found in he previously disturbed fill near the top of Kiva C. It eems quite certain that troughed metates were not in use uring the latest component in Mug House. Perhaps this ne fragment may be left over from one of the earlier ccupations.

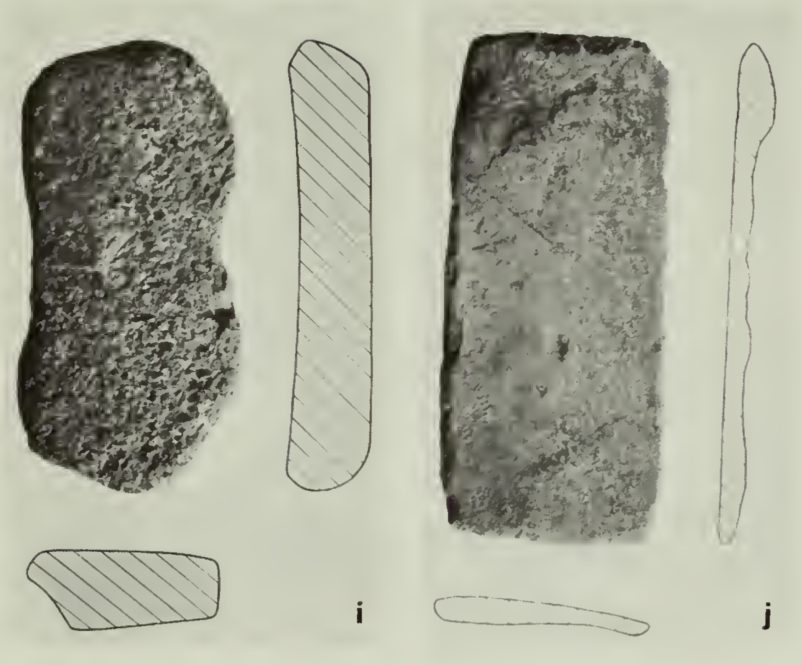
Metate Blanks. Six complete specimens and one ragment closely resemble metates in most features, ut they lack the distinctive grinding surface (fig. 237f). t is probably safe to assume that these items were "blanks," intended for use as metates.

Manos. Only those implements that exhibited distinct grinding faces resulting from reciprocal motion against metates were classified as manos. (Many small tools from Mug House have been excluded from this class because their ground surfaces indicate a different motion. They are described later as handstones. Also, many sandstone slabs, trimmed around the edges, have outlines similar to manos, but they should not be confused with manos or mano blanks, either.)

The 492 manos from Mug House (fig. 238) can best be described in terms of their individual attributes. Styles are determined by various combinations of these attributes.

238 Some manos from Mug House.

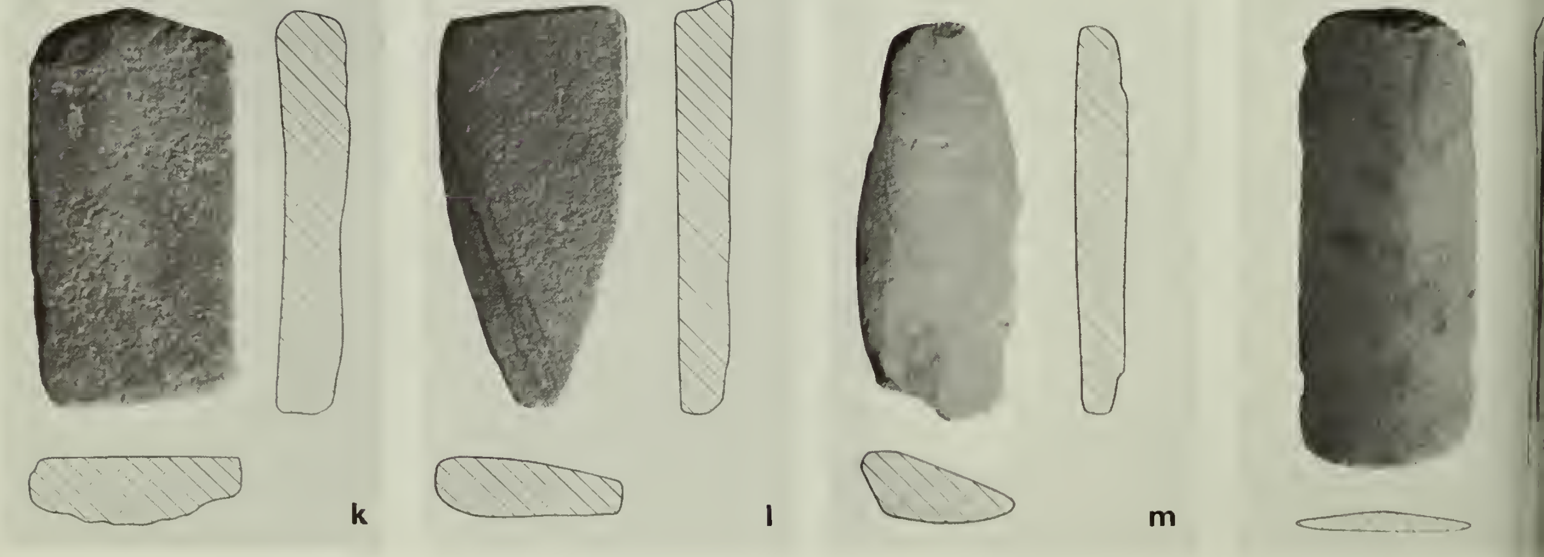


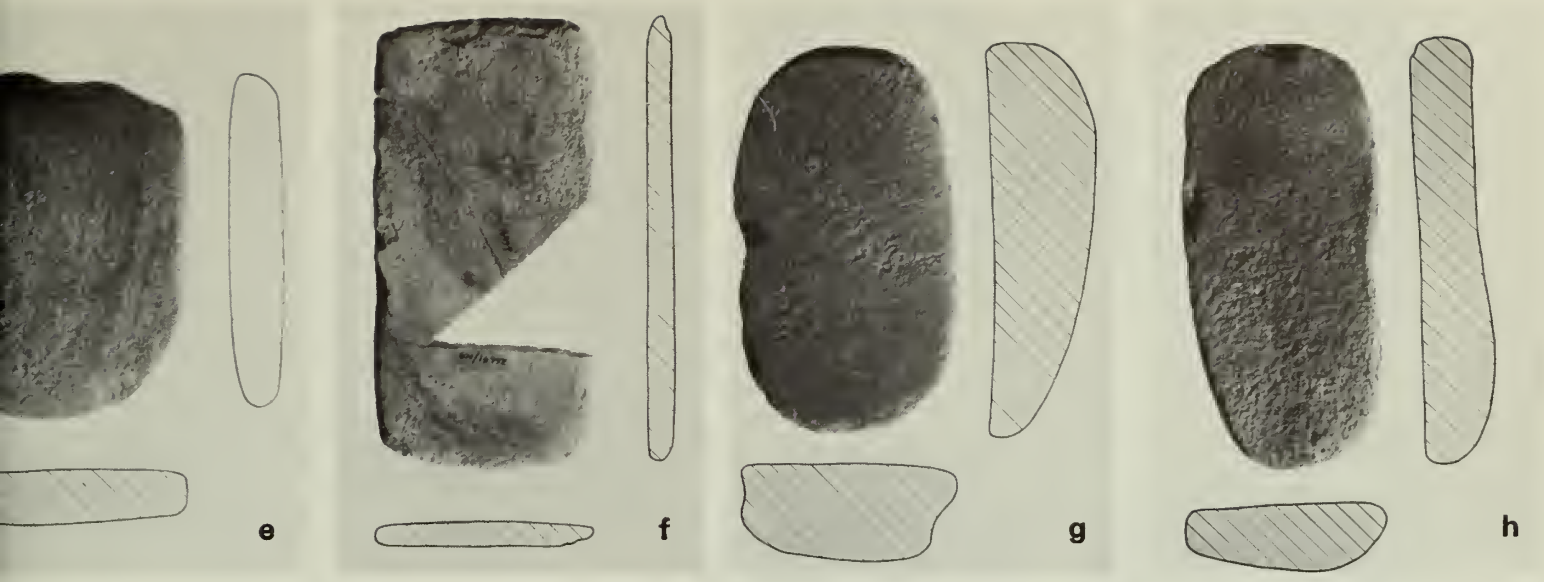


239 Plan view and sections of the various mano styles at Mug Hous a, XHU1; b–c, XSU2; d–f, XSB2; g–h, VHU1; i, VSB2 with finger grips; j–k, VSU1; 1, n, VSU2; m, unclassified; o, VSU3; p, VSB with finger-grips; q, VSB3; and r, VSB4.

The most important characteristics are those associate with the grinding surfaces. A surface that is conve (*X*) from end to end presumably rode back and forth in troughed metate, usually acquiring rounded or cante wear-facets (*Xc*) where the ends rubbed against th sidewalls of the trough. Occasionally, convex surface lack these canted ends (*Xn*). On the other hand, a flat o concave (*V*) profile indicates use against the surface of plain-faced metate. None of these have canted ends All grinding surfaces are convex or flat from side to side

The backs of some manos seem to have been intentionally shaped into a low dome or hump (*H*), whil many others have back and front faces approximatel parallel, like a slab (*S*). Virtually all of the "humpback manos have pecked finger-grips along one or both sides Those with a slablike form, unless they are thick an have grinding surfaces on both faces (*B*), rarely hav





finger-grips. Where only one face has been used (*U*), it is just as common to find two grinding surfaces (*2*) as it is to find only one (*1*). Bifacial manos may have two separate grinding surfaces on each face (*4*) or two on one face and one on the reverse (*3*).

These attributes combine into 13 styles or substyles (table 26). Such attributes as material, size, and shaping technique also vary from style to style, but they did not prove to be as useful for primary sorting purposes. Undoubtedly materials influenced thickness and weight and shaping techniques. Certain materials may have been chosen for their coarseness.

With the almost complete absence of troughed metates in Mug House, it is surprising that there are 41 *X* (convex) manos in the collection (fig. 239a–f). None of these, however, were found *in situ* on floors or in direct association with metates. They were generally scattered through fill disturbed by previous digging, in the rubble of fallen buildings, or on the trash slope. Several came from beneath the floors of the latest occupation. Since four of the five manos recovered in Component A and B deposits belong to this *X*-grouping and none were found in association with Component C, it would seem logical that all of them were used in connection with the two earlier occupations of Mug House. If any were kept by the later people, they were not used by them, since the flat-topped metates would alter the contour of the grinding surface.

The *V* (concave) manos belong with the flat-topped metates of the latest component and are customarily found on the floors of rooms and kivas, often in association with metates. Occasionally they have a slightly convex grinding face that would fit the occasional plain-faced metate with a slightly concave cross section. They separate readily into two groups based on the presence or absence of the "humpback."

VHU manos (always unifacial) are consistently shorter, thicker, and more ovate in outline than the others, and nearly always have finger-grips along one or both sides (fig. 239g–h). The majority were made from local sand-

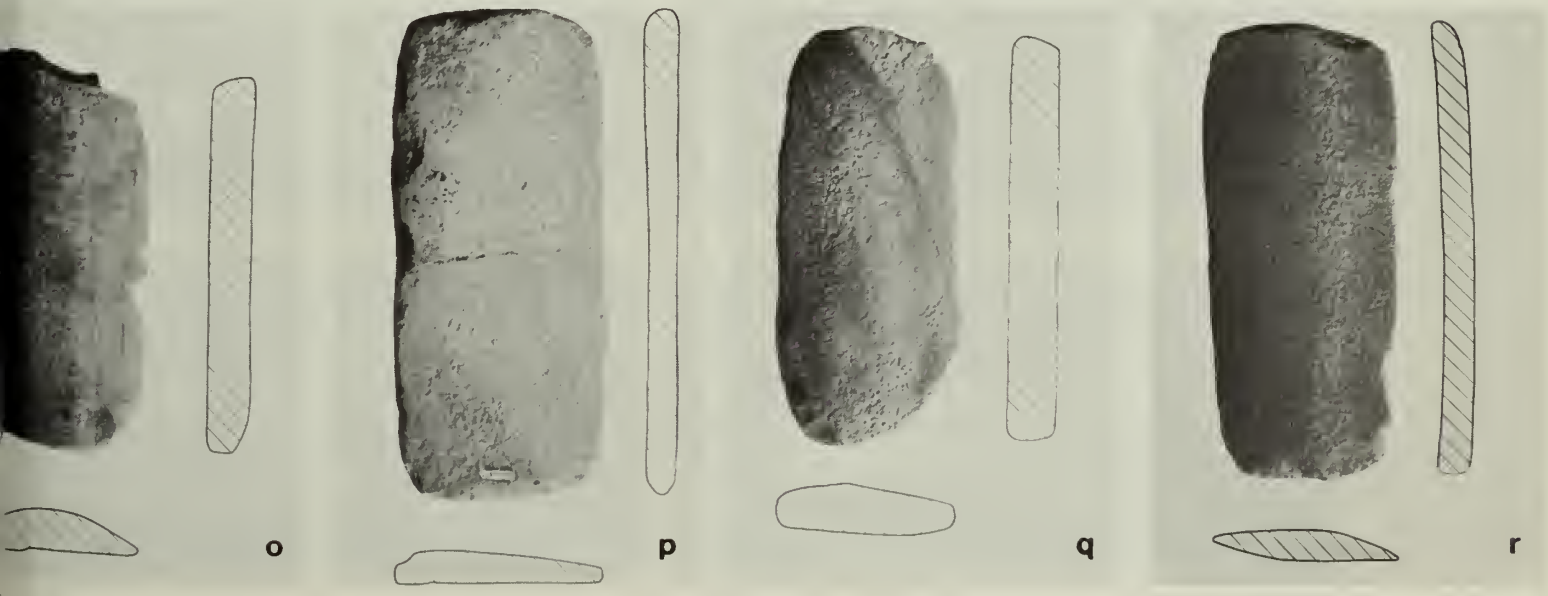


TABLE 26.—MANOS

	Materials								Average dimensions			
Style	Total number	(Whole speci-mens)	Mesaverde sandstone	Other sand-stone	Con-glom-erate	Breccia	Diorite	Misc. igneous and meta-morphic	Length (cm.)	Width (cm.)	Thickness (cm.)	Weig (gm
XHU1......	8	(6)	2	2	....	....	1	3	20. 2	11. 8	4. 2	1,
XSU1......	14	(8)	11	1	....	....	1	1	20. 6	11. 7	3. 0	1,
XSU2......	8	(3)	8	....	....	....	....	....	21. 9	10. 7	2. 7	
SXB2.......	8	(6)	3	5	....	....	....	....	21. 8	12. 1	3. 0	1,
XSB3.......	3	(1)	2	1	....	....	....	....	23. 2	12. 0	2. 7	1,
VHU1......	60	(45)	25	8	19	5	2	1	23. 0	11. 9	4. 6	1,
VHU2......	7	(4)	3	....	2	1	1	....	24. 8	12. 3	3. 9	1,
VSU1......	142	(71)	130	9	....	....	1	1	27. 6	12. 8	2. 9	1,
VSU2......	158	(71)	151	3	2	1	....	....	27. 7	12. 0	2. 5	1,
VSU3......	1	(1)	1	....	....	....	....	....	23. 5	10. 9	2. 4	
VSB2.......	43	(16)	24	....	16	....	4	....	27. 3	12. 8	3. 1	1,
VSB3.......	34	(10)	28	1	2	3	....	....	26. 7	11. 9	2. 5	1,
VSB4.......	6	(4)	6	....	....	....	....	....	25. 5	12. 1	2. 9	1,
Uncl.......	12	(1)	9	....	1	....	1	1	22. 1	8. 9	3. 3	

Key to Style Abbreviations:

X=Grinding surface *convex* end to end. S=Flat or *slablike* back. U=*Unifacial.* 1,2,3,4=Number of grinding surfa

V=Grinding surface *concave* end to end. H=Rounded or *humped* back. B=*Bifacial.*

stones, but a significant proportion were made from conglomerates and breccias. Pecking and grinding on the back were generally concentrated along the edges to produce the hump, in contrast to the general reduction of high points on the *VS* manos. The facts that many were made of coarse-grained material and that they were generally shaped by unifacial rather than by bifacial spalling suggest that they had some special purpose. Four were found together on the floor of Kiva D, and a fifth was found on the floor of Room 66.

VS manos are the most numerous and come in the greatest range of styles, primarily because they may be unifacial or bifacial (fig. 239i–l, n–r). They are nearly rectangular and quite thin, even those that have hardly been used. They were almost always made from local sandstone, the most notable exception being a group of 13 *VSB*2's (concave grinding surface, slablike section, bifacial, one grinding surface on each face), with finger-grips, made of conglomerate and quartz diorite (fig. 239i). Sides and ends were bifacially spalled somewhat more often than they were unifacially spalled, and very frequently they were pecked or ground over the spalling. Finger-grips occurred on only 20 specimens. Fifteen of these were made from the coarser and heavier materials. A like number exhibited a noticeable constriction in the center as if this might serve as a substitute for finger-grips where the implement was too thin. Seventeen *VS* manos were found on the floors of both rooms and kivas.

Regardless of style, the grinding surfaces of manos with two grinding surfaces on a single face are of unequal width in approximately two-fifths of the cases. Apparently, the surfaces were used independently rather than in a rocking motion. Between 80 and 90 percent of all grinding surfaces had been "sharpened" in much the same manner as the metates. Finger-grips occur almost exclusively on *H* manos, regardless of material, and on *VSB* manos made from the coarser conglomerates o igneous rocks. Medial constriction may have bee substituted for finger-grips on the thinner *S* models, as i is never found on *X* or *VH* specimens. Grinding reduce high spots on the backs of approximately three-fourth of the *S* manos, often following general trimming b pecking. Mano sides were also commonly ground smoot over the initial spalling. Only on the *VH* styles is grindin less frequent than pecking. Thus the Mug House mano are properly considered as ground stone artifacts whos process of manufacture involved shaping by spalling an dressing by pecking and grinding.

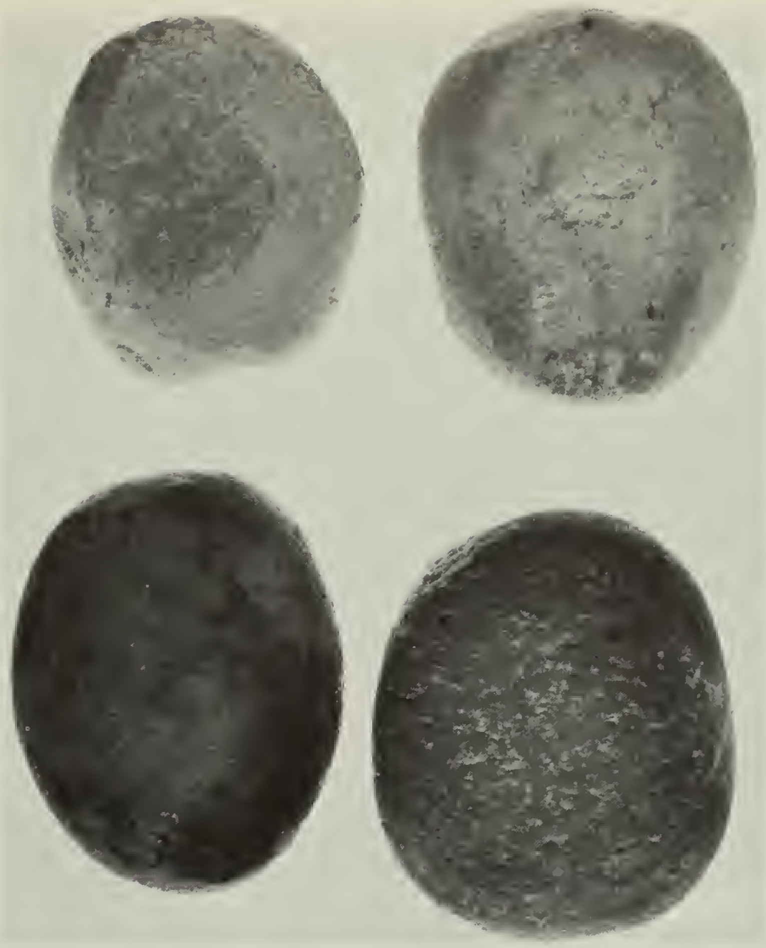
Even though the *X* style manos are earlier than the style, the *H* versus *S* distinction seems to have no tempora significance. The *H* style manos tend to be coarser an heavier than the *S* style ones. The two styles may hav been used for different purposes.

Mano Blanks. Twenty-eight specimens, 18 of them complete, appear to have been fashioned for use a manos, but lack the grinding surface to indicate that they actually had been used as such. They exhibit essentially the same characteristics as manos of the *V* styles, and in approximately the same proportion. The intended grinding surfaces were prepared by either pecking or by grinding or, in several instances, by both. Since all of these mano blanks clearly belong to the *VS* variety, perhaps the *VH* styles and the *X* were no longer mad at the time of the latest occupation of Mug House.

Grinding Stones. This class includes all relatively larg stones which have one surface altered by use grindin (fig. 240). They appear to have been nether stones o which other tools (perhaps handstones) were applied or against which the object to be ground was rubbed. There is no standard shape or size and the shallow, basin-shaped grinding surface is always smaller than the face on which it occurs. In spite of the irregular shape, many of the sides have been spalled, pecked and/or ground. Some of these surfaces were "sharpened." All but one of these implements were made of local sandstone. The single exception was made of the volcanic breccia that is found on the southern end of Wetherill Mesa as well as in other parts of Mesa Verde. Five of the 31 specimens were either made from large fragments of former manos or were combination tools used alternately as nether stones and as manos. Grinding stones were found scattered throughout the general fill in Mug House, the only significant finds being a pair located on the floor of Kiva E and one serving as part of a cover for a corrugated storage jar in Room 71.

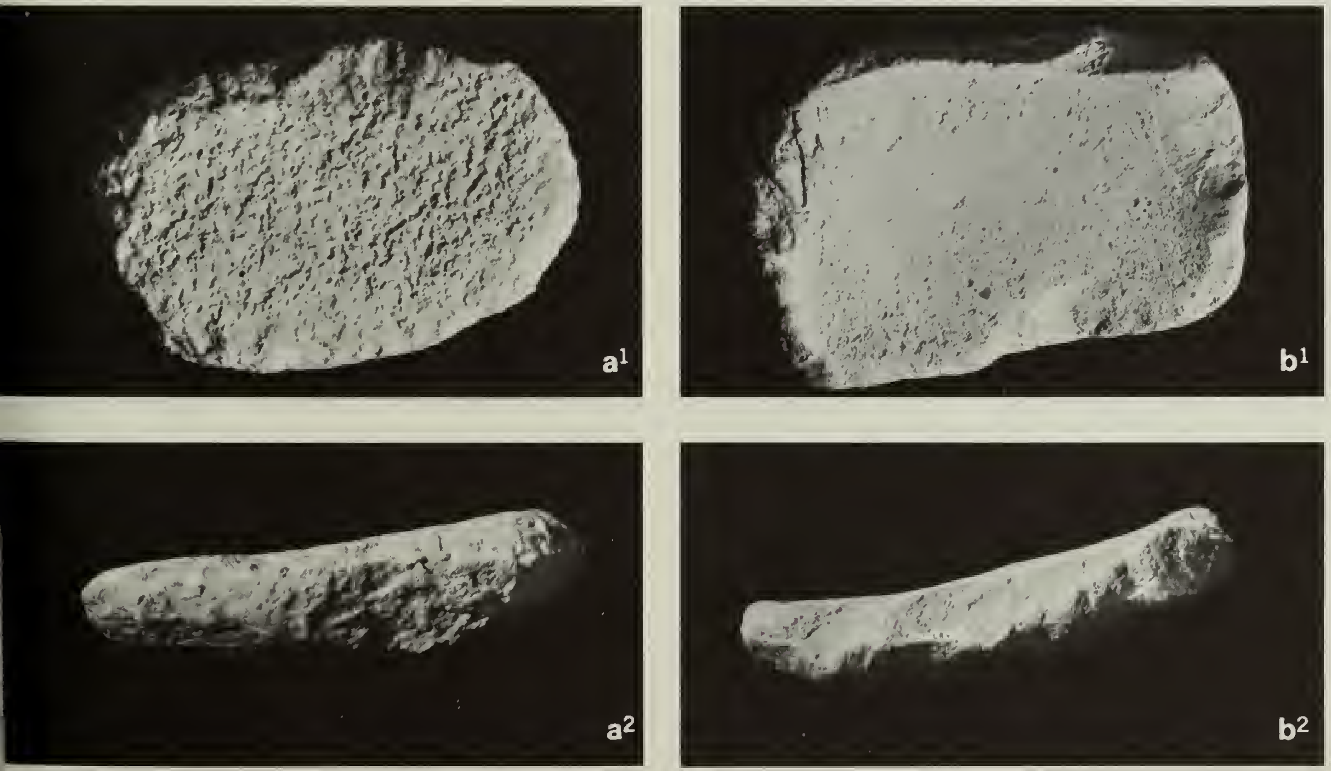
Handstones. Small grinding stones that could be held in one hand are designated as handstones. They are oval in outline with convex wear-facets on both faces (fig. 241). Some of these wear-facets have been "sharpened," and all are highly polished. The perimeter is frequently battered or pecked and sometimes ground except where waterworn edges have been left unmodified. There are 15 of these tools: 9 manufactured from waterworn cobbles, and 6 from fragments of Mesaverde sandstone. Three of them were found on the floors of as many kivas, and the rest came from trash deposits throughout the cave. There was no indication that any of them were associated with the two earlier components.

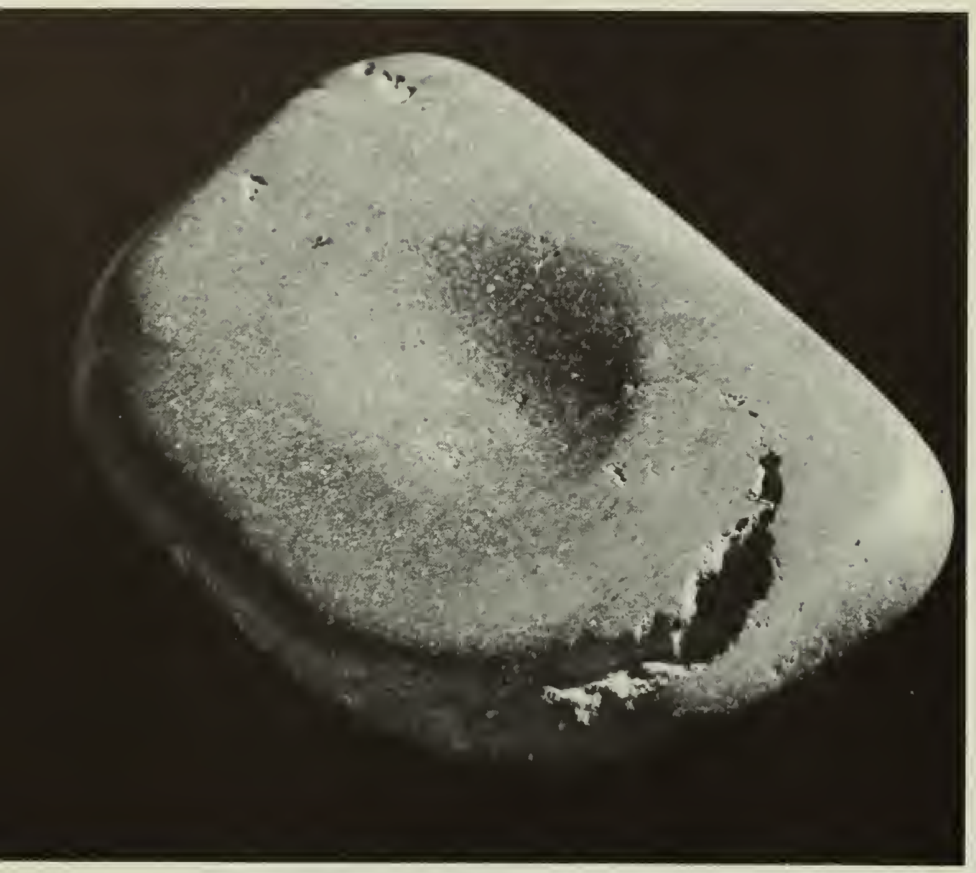
Mortars. One complete and one fragmentary specimen were found among disturbed trash deposits. The complete specimen was removed during stalilization operations in 1935, possibly from Kiva A or Kiva C (fig. 242). Both specimens were made from waterworn cobbles of diorite by working a small oval depression into the center of one of the flat faces. Similar items from Pecos Pueblo were called "paint-grinding stones" by Kidder (1932, pp. 72–74).



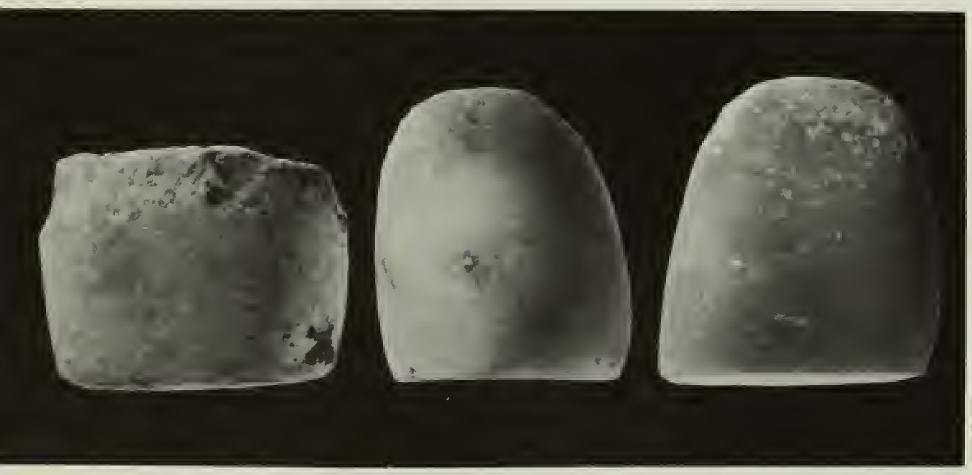
241 Handstones.

240 Top and side views of two grinding stones.





242 Stone mortar from Mug House in Mesa Verde Museum collection



243 Paint pestles.

Paint Pestles. There are three complete specimens manufactured from pebbles of milky quartz (fig. 243). Two were made from the ends of elongated pebbles, with the rounded end pecked and the broken end ground flat and highly polished. The third was made from the mid-portion of an elongated pebble, with one end flat and highly polished and the other end broken off. A pecked groove encircles this specimen just below the point of breakage, as if this groove were intended to guide the break. In each case, the diameter of the grinding face approximated the height. Red stains on the polished flat surface suggest use of these tools in grinding paint pigments. Woodbury (1954, pp. 94–95) describes similar implements under the heading "Paint Grinding Stones" and notes three instances in which they were found in direct association with paint grinding slabs and paint pigments. All three of the Mug House specimens were found in rubble fills. None were directly associated wit any kiva or living space.

Abrading Stones. When metates, manos, handstones, an so on had been sorted out of the general grouping o grinding implements, there remained a variety of sandstone pieces exhibiting at least one surface modified b use grinding. These surfaces vary from slightly convex t slightly concave, and appear to have resulted from th use of sandstone as an abrasive in the shaping an finishing of other implements of stone, bone, shell, an wood. A tool is considered to be an abrading stone if i can be held in the hand and rubbed back and fort against the object to be ground.

Several styles of abrading stones have been distinguished according to the character of the grinding surface, the nature of the material, and, to some extent, th form of the stone itself. Most numerous (32) are the *so abraders* made from gritty sandstone. They are flat an can be held in the open hand, using the fingers and th palm. Because the stones were poorly consolidated, thei surfaces never required sharpening. Their sides and end were frequently shaped by spalling, pecking, and, occasionally, grinding. *Hard abraders* are somewhat larger an made from tougher sandstone, so that all nine specimen had their grinding surfaces sharpened. They, too, wer occasionally shaped. One small, thin slab of very har sandstone exhibited a highly polished surface whos luster resembles that of a whetstone. Another sma prismatic piece of hard sandstone had four faces, eac about 2 cm. wide, three of which had been ground by us similar to that of a file.

Also included under abrading stones are five irregula pieces of sandstone with narrow, V-shaped grooves mad by sharpening the tips of pointed bone and woode objects such as awls. All of these specimens came fro the general fill of Mug House. Many V-shaped groove and also broad grooves that might have resulted fro grinding or sharpening stone axes, were found on cli faces, ledges, and blocks of sandstone in or near the site

Only eight of the abrading stones, all soft abrader were found in the exact positions where they may hav been placed by their owners. Three were found on th floors and five on the banquettes of Kivas E, F, and H This association with spaces presumably used by men both for ceremonial and work purposes, strongly suggest that tools of this sort were primarily employed by men.

The vast amount of grinding performed on buildin stones, various tools, and other artifacts would sugges that we should have found more than the 48 abradin stones in our collection. Many stones encountered durin our excavation revealed signs of abrasion, but eithe their fragmentary condition or doubt as to their rea function caused them to be discarded. The Mugueno had close at hand an ideal abrasive material in the sandstones of the Mesaverde group, and this may account fo their lack of concern with shaping implements to b used for abrading purposes.

POLISHING AND RUBBING TOOLS

Polishing Pebbles. A number of small waterworn pebbles, not over 7 cm. in maximum diameter, bear from one to four distinct wear facets with transverse striations on their flatter faces. They may have been used mainly for polishing pottery, as at the modern pueblo of San Ildefonso (Guthe, 1925). They are. principally of quartz, quartzite, chert, basalt, and hard sandstone.

The 44 polishing pebbles came from various provenìences. Most of them were in trash deposits, but a considerable number were in the rubble of collapsed rooms. One was found on the floor of Kiva F and another was part of a possible "medicine kit" with Burial M6.

Rubbing Stones. Larger, waterworn cobbles, up to 16 cm. in length, with wear surfaces on the larger and flatter faces are here called "rubbing stones." The larger specimens resemble what Kidder (1932, p. 64) has termed "floor polishers." None of them have the battered ends found by Woodbury (1954, p. 88) in the Awatovi collection although two have been pecked around the perimeter, as if to finish them. In the four cases where only fragments of cobbles were used, the sharp broken edges were blunted by grinding. All wear surfaces were highly polished and none showed signs of "sharpening." Of the 15 rubbing stones in the collection, 11 are diorite and other igneous rocks, 3 are quartzite, and 1 is very hard sandstone.

One quartzite specimen came from Level V of the trash slope and belongs to Component A. Another one of quartzite was found on the floor of Room 71, while two other rubbing stones were found on the banquettes of Kivas F and H. The last was made from a fragment of a quartz diorite cobble that once belonged to a similar tool of larger size, for another piece of the same cobble came from refuse nearby.

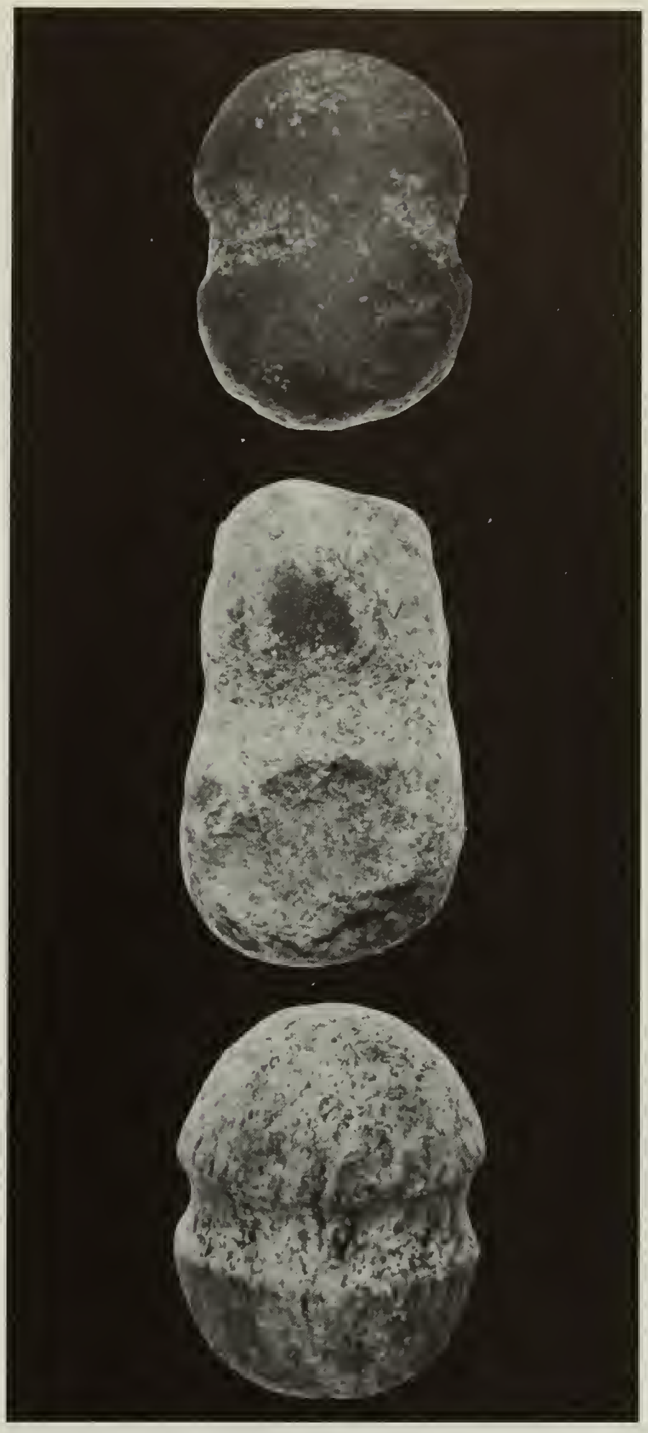
POUNDING TOOLS

Mauls. A maul is a large hammer used for heavy-duty pounding. Only two fragmentary tools found in Mug House refuse deposits may be so designated. The smaller one seems to have been roughly cylindrical in shape, a little more than 8 cm. in diameter and possibly twice as long. A pecked groove encircles the stone, suggesting that is was originally hafted. Its final shape was achieved by chipping and pecking a large chert core. The second specimen is part of a large granite boulder. It may have. been more than four times as big as the smaller maul. Traces of pecked notches on its narrow sides indicate that it may also have been designed for hafting.

Notched and Grooved Hammer Heads. Although only 20 such implements were found, they may be sorted into six different styles according to the kind of notching or grooving prepared for seating the haft or handle:

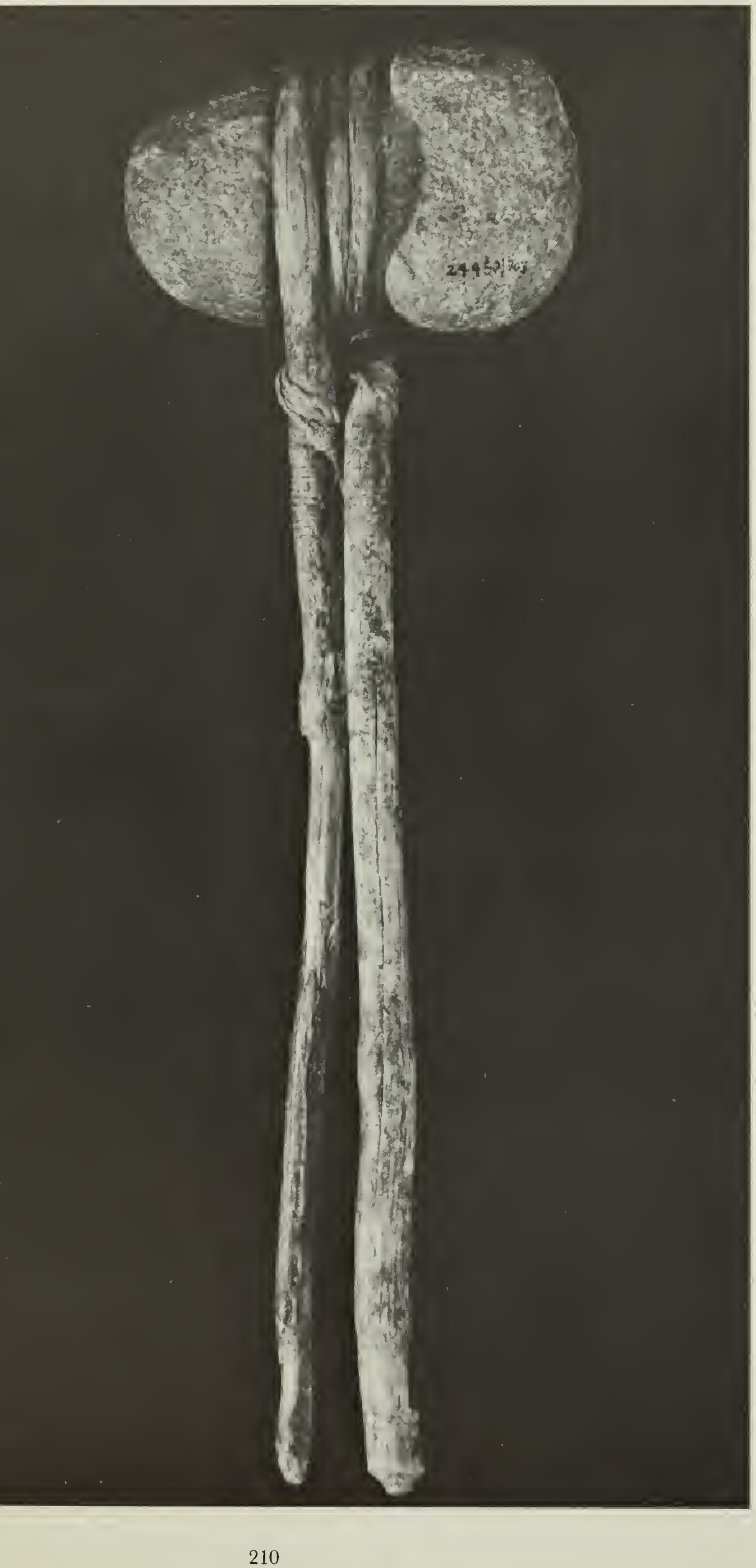
Style 1—notched on one side	4
Style 2—notched on two opposite sides	4
Style 3—partially grooved	1
Style 4—full grooved	5
Style 5— full grooved with additional notch in poll	1
Style 6—dulled and wornout axes	5

Notches and grooves in 18 specimens were produced by pecking and, often, by some grinding. Two specimens, one each of Styles 1 and 2, were notched by bifacial chipping. All of these implements were battered on the ends by use.



244 *Notched and grooved hammer heads.*

In general, hammer heads of this class were made by one of three methods. Axes that had become dulled by use were used as hammers with no further alteration. When starting from scratch, the maker selected a suitable cobble of hard rock such as granite, quartzite, basalt, porphyry, or diorite. Sometimes this cobble needed no further modification other than some provision for hafting (fig. 244, bottom). Most of them, however, were brought to their final form by chipping and/or pecking and often some grinding (fig. 244, center). Two specimens were made from chert cores.



245 *Hammer head with oak handle from Room 44 fill.*

We may assume that all these tools were hafted i some way, although only one hammer head has a complete handle. It is a partially peeled branch of oak about 92 cm. (3 feet) long and 1 cm. thick, wrapped twice around the groove so that the two ends extend parallel for about 30 cm. (1 foot) from one side of the head (fig. 245). Just below the head, the ends are wrapped four times with a yucca-fiber cord tied in a square knot. Wear marks indicate that the ends were once wrapped also near the butt of the handle.

Excepting the reclaimed axes, weights average approximately 390 gm. and range from 160 to over 650 gm. The re-used axes are considerably heavier and bring the average for all 20 specimens to 429 gm. The heavies hammer head weighs 1,031 gm.

Pitted Pounding Stones. These tools have battered end and small, shallow pits pecked in one or more of the fou larger faces (fig. 246). The 10 more thoroughly worked specimens approach a true rectangular solid shape with rounded corners and four flat, ground and polished faces. Seven others are only partially modified cobbles.

Eighteen complete specimens (there is one fragment) average 13.1 by 8.8 by 6.8 cm. in size and 1,258 gm. in weight. Lengths range between 9 and 16 cm., with 16 of the 18 tools exceeding 12 cm. in length. The heaviest tool weighs 1,780 gm. and the lightest 920 gm. Stream cobbles of quartzite, porphyry, diorite, granite and a very hard sandstone provided most of the raw materials. Several were also made from the local Mesaverde sandstone.

The well-battered ends suggest repeated use in pounding. There is no provision for hafting. The implement were probably held in the hand and the shallow pit acted as finger-grips. Morris (1939, pp. 128–129) referred to tools such as these from the La Plata Distric as "pitted rubbing and pounding stones." Similar tool are called "elongated pitted hammerstones" by Woodbury (1954, p. 91). Both series are smaller than those from Mug House. The La Plata specimens are mos common in Pueblo I and the Awatovi specimens occu mainly from Pueblo III to Pueblo V.

It is possible that the Mug House tools had two use also, with the ground and polished faces resulting from wear when the tool saw service as a rubbing or smoothing stone. The altered faces, however, differ slightly from those of ordinary rubbing stones and seem intended to shape the tool. Furthermore, the pits in each altered face would hinder any smoothing or rubbing activity.

All pitted pounding stones from Mug House definitely belonged to Component C. One was found in a storeroom; another in a corrugated jar set beneath the leve of Courtyard C; four were on the floors and banquette of Kivas D, E, and H; and the others occurred in the rubble and refuse. The absence of these tools from domestic rooms and their presence in the kivas suggest they were primarily used by men.

Hammerstones. One of the three largest tool groups found in Mug House were the hammerstones. (Manos

246 Pitted pounding stones.

and utilized flakes were the other two very large groups.) We saved only complete hammerstones, which total 411 specimens. Woodbury (1954) calls such tools "pecking stones." The term "hammerstones" seems to us a more comprehensive designation for these small lumps of stone that could be held in the hand and used for pounding as well as pecking.

All the Mug House hammerstones were made from cores or waterworn pebbles, and they exhibit considerable battering on the rounded ends and on promontories and ridges. There appear to be no satisfactory subdivisions according to form, so that the following breakdown by styles is based largely on the *source* of the chunk of stone used.

Style 1 (14 specimens)—Stream pebbles or cobbles, fragments of cobbles, battered on the ends and the sharper corners. Size range: 5.4 to 17.6 cm. in maximum length; 112 to 2,808 gm. in weight.

Style 2 (112 specimens)—Cores derived from waterworn pebbles or cobbles as indicated by the presence of some waterworn cortex. These are mostly igneous and metamorphic rocks from the Mancos River gravels. Battering is scattered on high points and ridges. Sharp promontories and edges have been blunted or ground off on 40 specimens. Size range: 4.5 to 10.4 cm. in maximum length; 43 to 908 gm. in weight.

Style 3 (151 specimens)—Cores with no cortex showing, mostly gray and green cherts from locations other than streams beds. Some igneous and metamorphic materials probably came from the Mancos River gravels. Battering is scattered on the high points and ridges. Ground and blunted edges and promontories may be seen on 72 specimens. Size range: 3.6 to 11.8 cm. in maximum length; 29 to 903 gm. in weight.

Style 4 (71 specimens)—Cores derived from rock outcrops or colluvial fragments with some angular cortex showing. Mostly cherts and sedimentary mudstones. Battering is scattered on the high spots and ridges. Ground or blunted edges and promontories occur on 39 specimens. Size range: 3.7 to 8.0 cm. in maximum length; 39 to 394 gm. in weight.

Style 5 (63 specimens)—Wornout or dulled tools and fragments of tools used as hammers. The materials vary with the original kind of tool. Battering is distributed on high points and ridges, often around the perimeter. Any of them may show ground surfaces from their former shaping and former use. Weight range: 42 to 802 gm. Four substyles are designated according to the original kind of tool from which these were made: (a) fragments of notched and grooved axes and hammers (16 specimens); (b) fragments of rubbing stones or handstones (10); (c) wornout or dulled choppers (24); and (d) dulled scraper planes (13).

The various shapes of the hammerstones and the battering on them seem to be purely fortuitous. All five styles were found in both Component A and Component C. (The small artifact assemblage of Component B did not include any hammerstones.) There is no shift in size or weight range from the earliest to the latest component.

Plotting the weights of the hammerstones by style revealed no significant differences between styles other than the tendency for Style 1 implements to have greater average weights than the others. Similarly, no obvious clusters of weights could be observed, although weight was undoubtedly a prime factor affecting the use of these tools. The median weight for all hammerstones approximates 100 gm., while the majority of all weights falls between 60 and 160 gm. There are steadily decreasing frequencies of weights up to approximately 420 gm., with about 25 specimens widely scattered above that point.

Hammerstones came from virtually every location within the site. Their presence on the floors of rooms and kivas suggests they were general purpose tools used by almost everyone in the village. Their great numbers suggest, further, that they were the most commonly used implements in construction, for shaping other artifacts or for "sharpening" grinding tools.

An unusual concentration of 25 hammerstones, representing Styles 2, 3, 4, and 5, came from the fill of Room 29/1, where there had once been six grinding bins. Twelve *V*-style manos also came from this room, and it seems probable that the hammerstones were used to resharpen the manos and metates here.

An interesting feature on hammerstones of Styles 2, 3, and 4 is the purposeful blunting of the edges and angular projections, not by pecking or battering but by grinding. We may speculate that sharp promontories or edges would cut or puncture the hand, and that grinding them down would reduce this hazard.

CHOPPING TOOLS

Ax Heads. A series of 71 stone axes was recovered during our excavations in Mug House. One specimen from the Wilmarth collection, now in the Colorado State Museum, and the five illustrated by Nordenskiöld (1893, pls. 34 and 35), all identified as having come from Mug House, bring the total sample to 77.

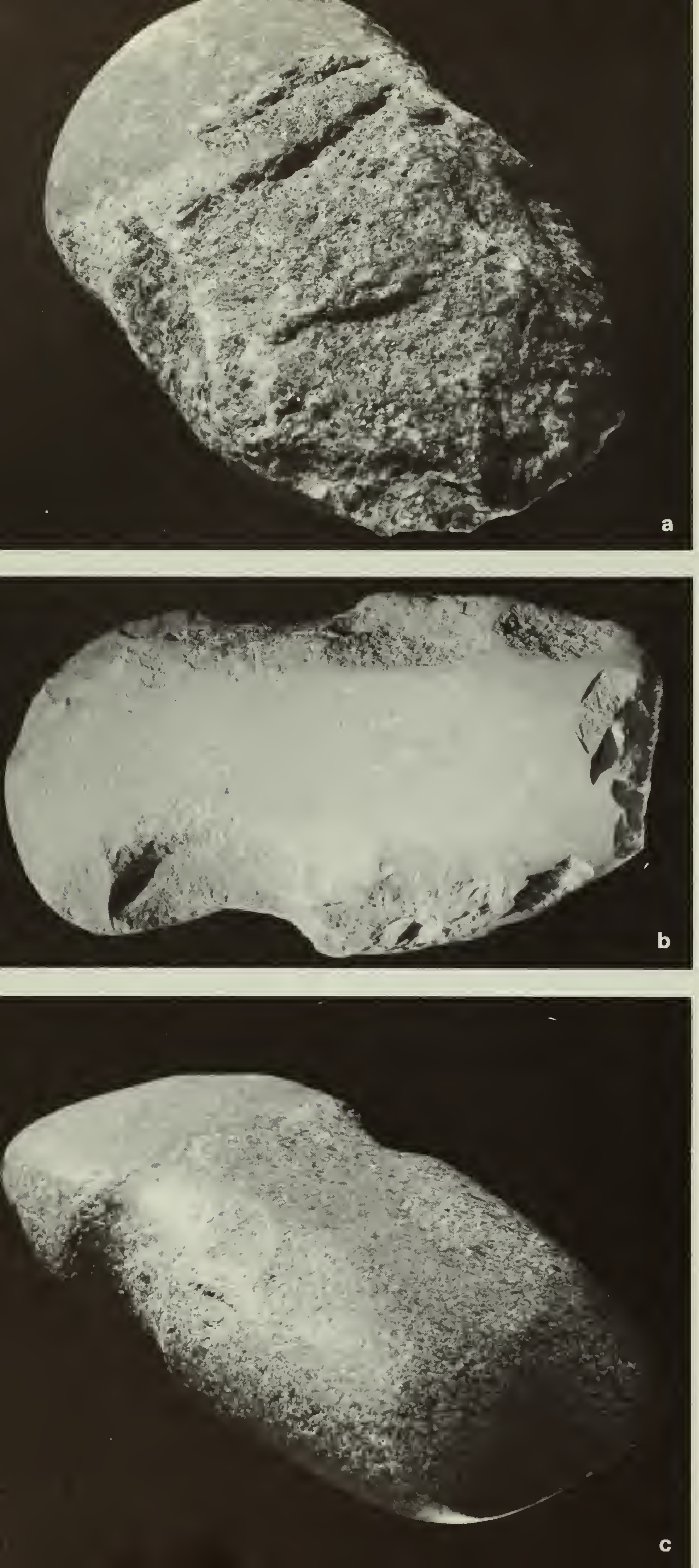
All 77 axes were manufactured from fine- or coarse-grained igneous rocks, quartzites, hard sandstones, and claystones that occur as stream cobbles in the high gravels of the Mancos River (table 27). A cobble of appropriate size was first roughly chipped into shape and then dressed by pecking and grinding. Notches or grooves placed approximately one-third of the distance from the poll to the bit facilitated the task of hafting. There is considerable variation in the making and placement of these notches or grooves.

Style 1 covers three specimens shaped entirely by chipping, with no evidence of grinding, even on the bit (fig. 247a). Opposed side notches were started by chipping and deepened slightly by pecking. The three specimens might be regarded as unfinished axes if the bit on two of them did not show unmistakable signs of use. We found these axes in positions suggesting that they were contemporaneous with the other styles of axes in Component C.

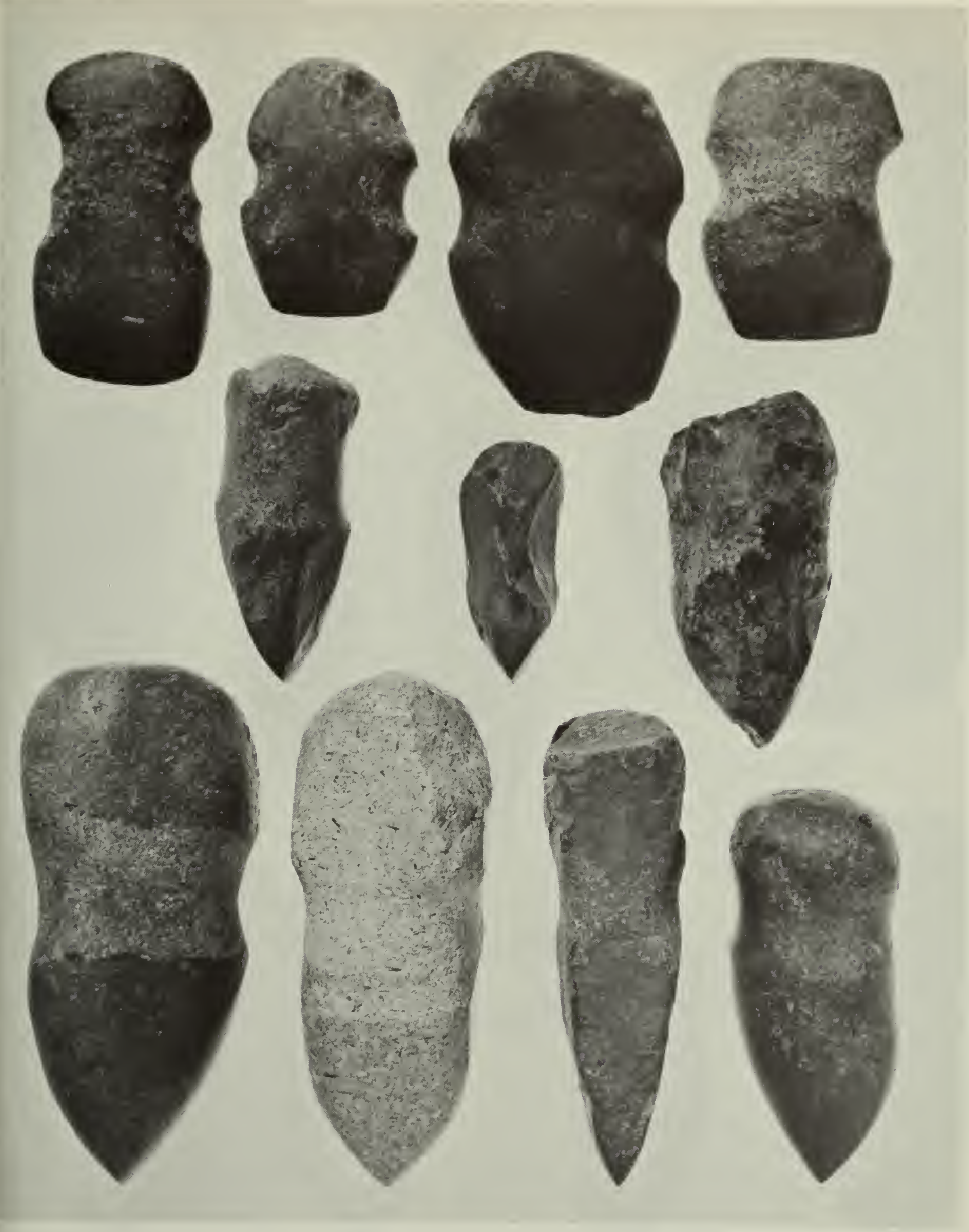
Grinding, especially on the bits, characterizes three other ax styles. *Style 2* axes are side notched (fig. 248, top row), except for three specimens with a triangular cross section and three notches, one at each of the corners. *Style 3* axes have a broad, shallow groove extending around the two sides but only on one of the two faces (fig. 249, lower right). The grooving on these axes differs from that on the "three-quarter-grooved" axes of southern and central Arizona, which are grooved on both faces and one side. *Style 4* axes are full grooved, with the broad, shallow groove completely encircling the ax (fig. 248, lower row).

Normally, grooves or notches were alined at right angles to the long dimension of the tool. However, they were placed at a slightly oblique angle on some axes of each style (figs. 248, upper row, and 249, upper left). Oblique notching or grooving occurs as follows: Style 1—1 of 3 axes; Style 2—7 of 15 axes; Style 3—3 of 7 axes; and Style 4—12 of 46 axes.

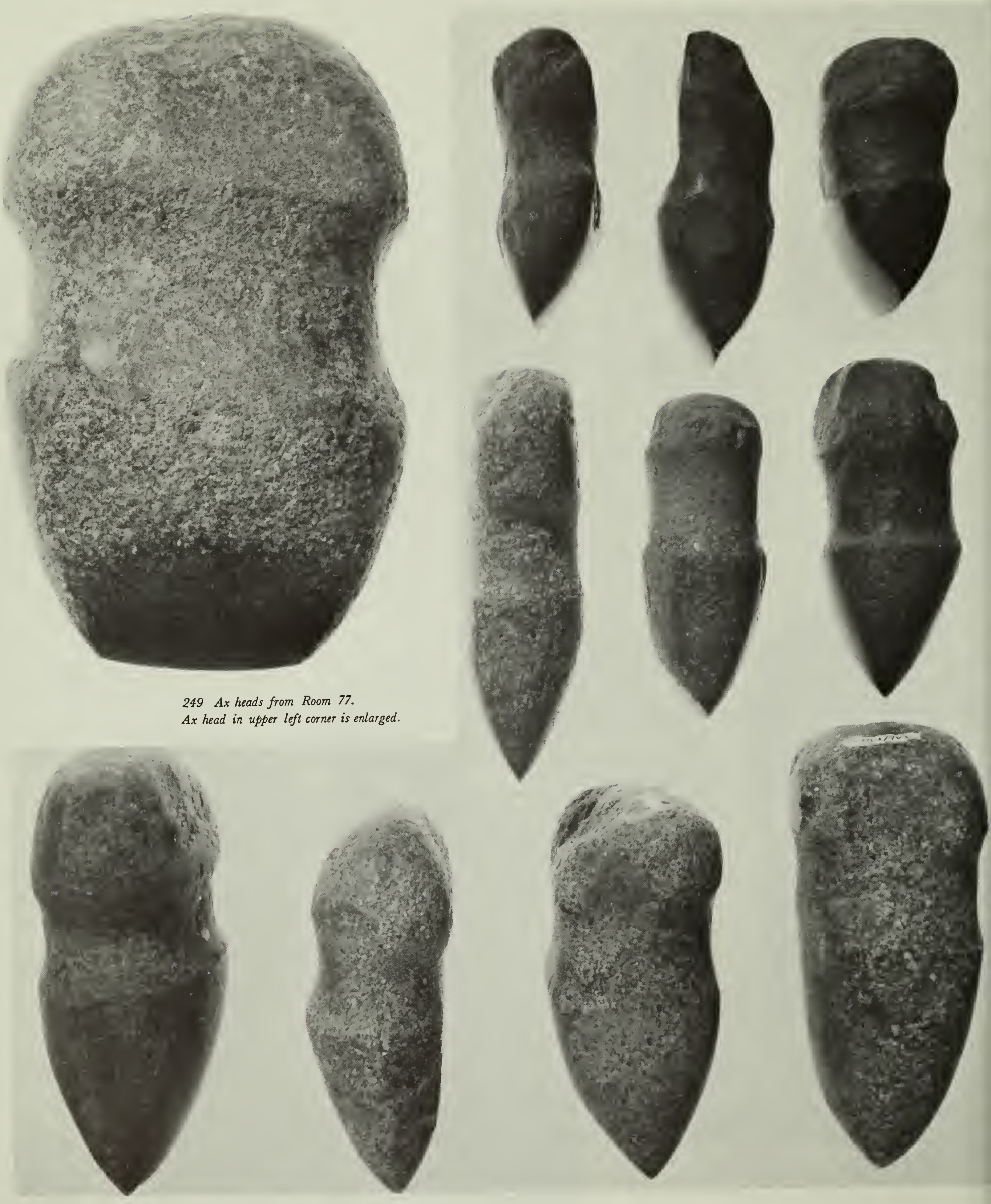
Axes with specialized grooves or notches, so common at Pecos (Kidder, 1932, p. 50), occur to some extent at Mug House. Specimens were found with double notches



247 Three ax heads showing degrees of finish, from partly chipped (at top) to fully ground and polished (at bottom).



248 *Ax heads.*



249 *Ax heads from Room 77.*
Ax head in upper left corner is enlarged.

TABLE 27.—STONE AX HEADS

	Styles				Unclass.	Totals
	1	2	3	4		
Fine-grained igneous rocks (basalts and felsites)	....	6	1	22	1	30
Coarse-grained igneous rocks (granites, diorites, porphyrys, etc.)	1	7	6	15	2	31
Quartzite	1	2	....	2	....	5
Claystone	1	....	....	1	....	2
Sandstone	....	....	....	6	1	7
Hematite	....	....	....	....	2	2
Totals	3	15	7	*46	6	77

*Includes 5 specimens illustrated by Nordenskiöld (1893).

on the outer side and a single notch on the inner side, and with double notches on both outer and inner sides (fig. 248, upper left). This latter could result from regrooving, such as Woodbury (1954, p. 33) noted in the Awatovi material, although only one of the three specimens looks as though it were regrooved. This specialized notching appears on 26 percent of the Mug House axes, in about equal proportions on all styles and on axes with oblique or right-angle grooving.

Every ax head was obviously designed for hafting, yet we found no complete handles. One incomplete handle on a triple-notched ax from the disturbed fill of Kiva C (fig. 250) shows the same double wrap-around method of attachment employed on the hafted hammer described earlier and on the double-bitted implement found by Nordenskiöld (1893, pl. XXXVI, 4). Possibly this was the standard method of hafting at Mug House. The fragmentary handle and the short segment of another associated with a full-grooved ax were made of young oak branches about 1 cm. in diameter.

Axes were found in a variety of locations, including both room and kiva floors. Although we may assume that the perishable handles rotted away, at least two axes came from dry deposits where handles, if present, would have been preserved.

Because the sides taper toward the bit, the length of the cutting edge on every ax is considerably less than the width of the rest of the head. In every case, the bit has a convex edge which frequently exhibits the nicks and chips caused by wear.

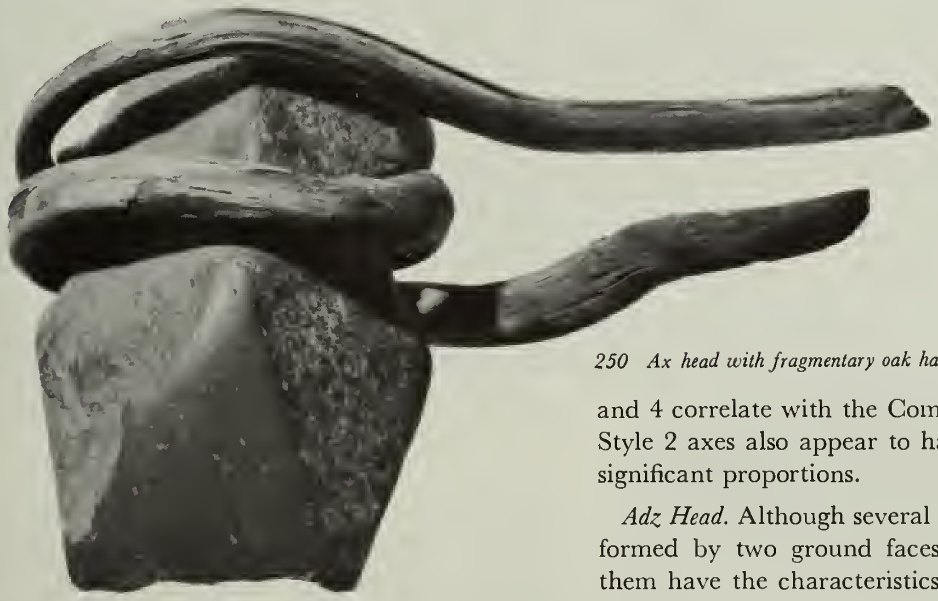
The poll on many ax heads showed battering, probably from use of these tools as hammers. Battering appears as the only modification on the poll of several ax heads made from cobbles that required only grinding of the bit and grooving for a handle.

Ax head sizes vary greatly. The maximum, minimum, and average measurements are given below:

	Maximum	Minimum	Average
Length	20.7 cm.	7.7 cm.	12.9 cm.
Width	9.4 cm.	5.0 cm.	7.0 cm.
Thickness	6.1 cm.	2.0 cm.	4.4 cm.
Weight	1,639 gm.	151 gm.	657 gm.

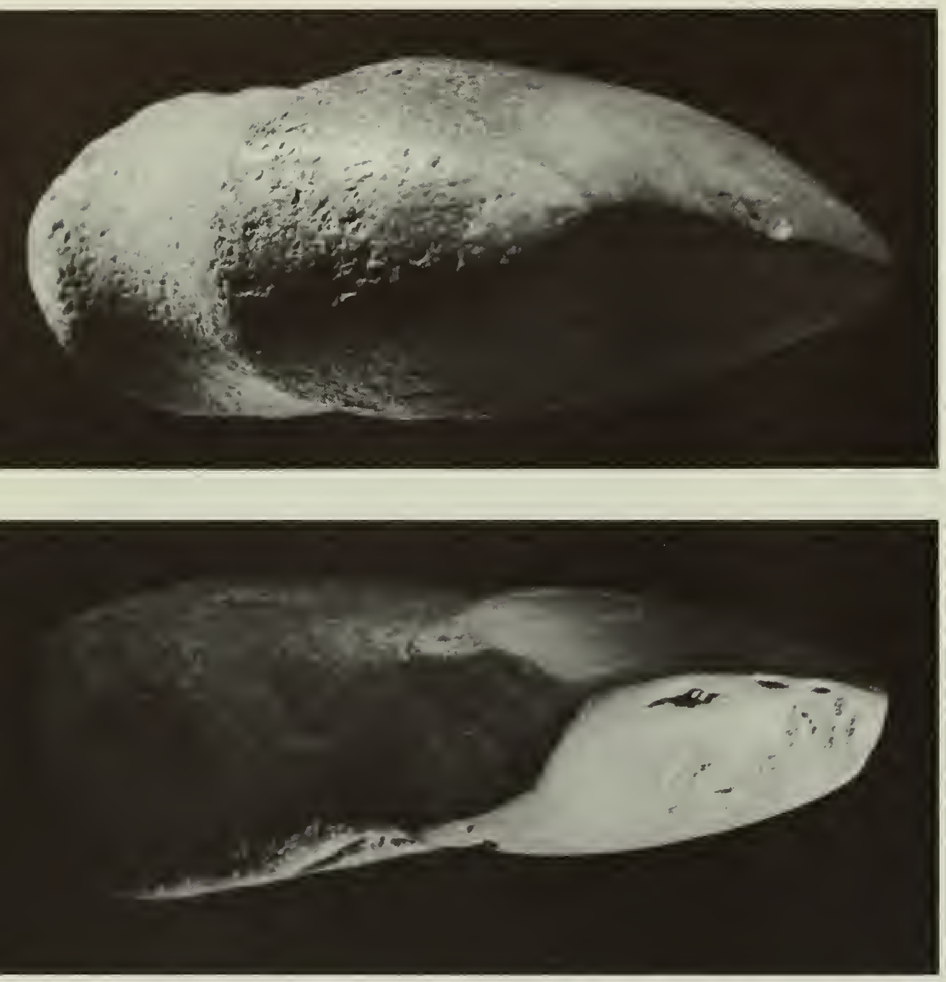
Ax heads belonging to Styles 3 and 4 occur together consistently in Component C locations. Two of Style 4 were found on the floor of Room 1; a third lay on the floor of Room 75, a small storeroom, next to a woven yucca pot rest. Eleven ax heads found in Room 77 include nine of Style 4 and two of Style 3 (fig. 249). Ten of the 11 from Courtyard G fall into this group; the exception, from the second story of the north tower (Room 60/2), belongs to Style 2.

The proveniences of Style 2 axes indicate a certain distinctiveness. Two axes of this style were found on the floors or banquettes of kivas, and another was found in the north tower. An ax of Style 2 and one of Style 3 formed part of the offerings with Burial M31. Styles 3 and 4 correlate with the Component C occupation, and Style 2 axes also appear to have existed at that time in significant proportions.



250 Ax head with fragmentary oak handle from disturbed fill in Kiva C.

Adz Head. Although several axes had asymmetrical bits formed by two ground faces of unequal size, none of them have the characteristics of a true adz. One specimen, however, found beneath the floor of Room 66, had an asymmetrical bit which is curved in a manner similar



251 Comparison of bits of ax head (above) and probable adz head (below).

to that of a gouge (fig. 251, below). Beveled wear-facets are visible on both faces adjacent to the bit. A shallow, pecked groove encircles two sides and one face. The poll is pecked or battered. The implement was formed from a piece of quartzitic sandstone. Its overall dimensions are 10.9 by 5.0 by 3.6 cm., and the weight is 334 gm.

The character of the bit should determine classification of a tool as an adz. Absence of a groove on one face suggests hafting with a sharp edge at right angles to the handle, but since several axes were grooved in the same way, it would be unsafe to assume this. This tool seems to be out of place among other Mug House artifacts.

Celt. Another unusual specimen, with a symmetrical bit but lacking any groove or notches, came from the lower fill of Kiva F. It was shaped by the usual chipping, pecking, and grinding from a core of reddish-brown basalt (fig. 252). It measures 8.4 by 5.9 by 4.1 cm., and weighs 231 gm. This tool must have been used, since the bit has been nicked by use and then partially resharpened. In all likelihood, this was another kind of ax, but we have no definite evidence of its having been hafted.

252 Celt.

Fragments of Bitted Tools. Three bit fragments were found in trash deposits. All were well ground with slightly dulled edges, and one showed signs of a pecked notch or shoulder at the point of the break. The fact that two were made of shale and the other of chert, with a very narrow bit measuring only 1.3 cm. at the edge, indicates that none of these could have been fragments of axes. They might better be classed with miscellaneous, problematical objects, rather than with chopping tools.

Choppers. Seventy-six stone artifacts displayed the coarse and sinuous chipped edge so often designed for chopping purposes. They are relatively small, averaging less than 100 gm. in weight and around 10 cm. in maximum length. Most of them are little more than utilized cores and flakes, with a minimum of flaking to produce the chopping edge.

Three styles of choppers are recognized. *Style 1* choppers were made from cores. Four large specimens weigh more than 260 gm. and 44 small ones weigh less than 150 gm. One chopper of intermediate weight had a discoidal shape with use chipping and battering around the entire perimeter. The 24 choppers of *Style 2* were made from flakes and weighed less than 70 gm. The two choppers of *Style 3* were fashioned from the fragments of other tools.

The choppers were made of chert, claystone, quartzite, basalt, granite, and diorite. They came from refuse deposits, the trash slope, and the ruin generally. There is no indication of any change in fashion from the earliest to the latest component. Two Style 1 choppers, one large and one small, were found on the floor of the south tower (Room 76).

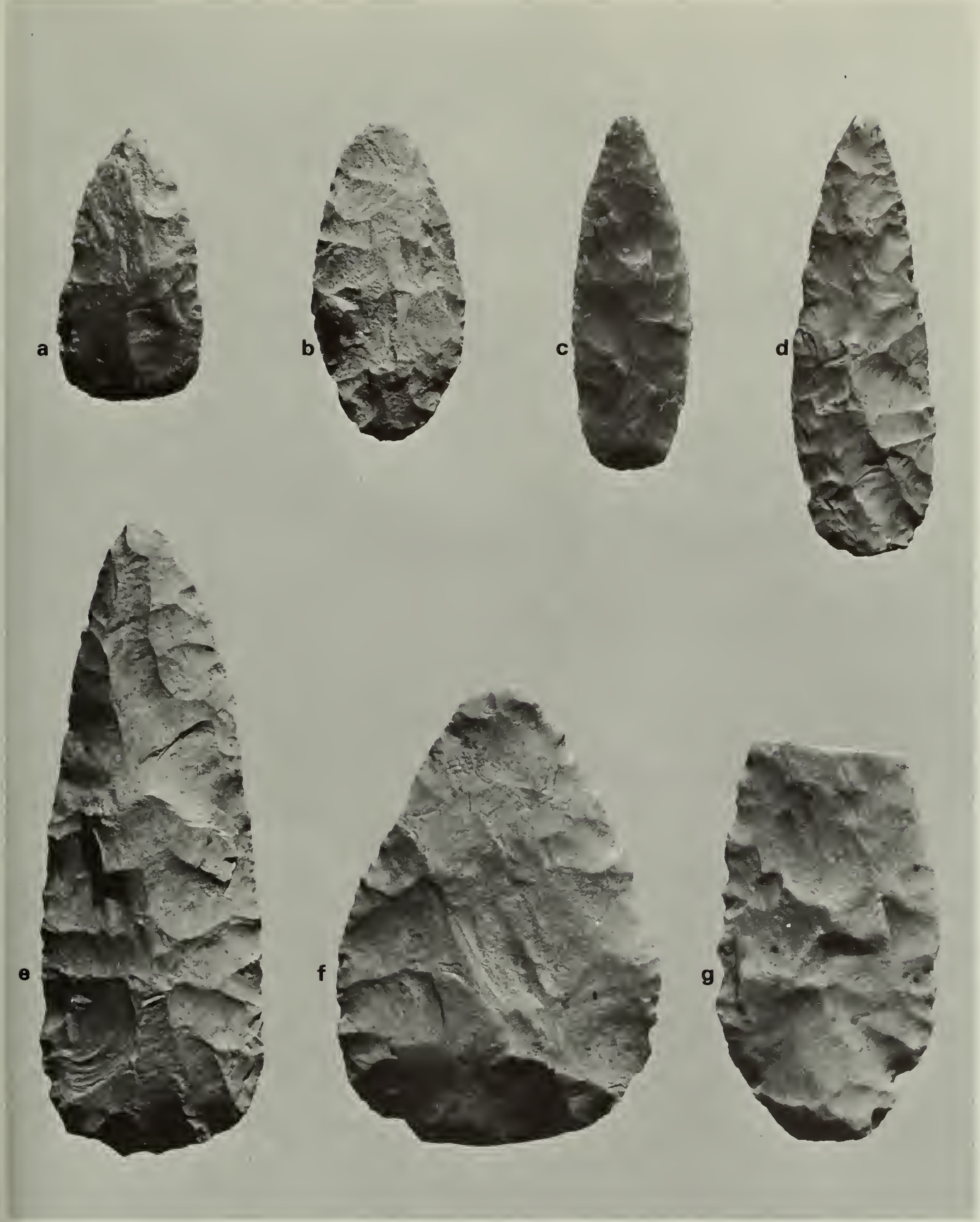
In general, the Mug House choppers appear to be rough, crude, poorly made, general purpose tools, perhaps only to be used for relatively short periods. Many undoubtedly became hammerstones once their sharp edges were dulled. The larger ones could have been grasped in the hands, but the smaller ones must have been held with the fingers. Exactly what use this implies is open to speculation.

Utilized Flake. Of the great mass of flakes whose sharp unretouched edges saw a variety of uses, only one appears to have been used for chopping.

Utilized Cores. Eight chert cores had been utilized for chopping, without having been specially prepared like the Style 1 choppers. They were found in refuse and rubble deposits of all three components.

CUTTING TOOLS

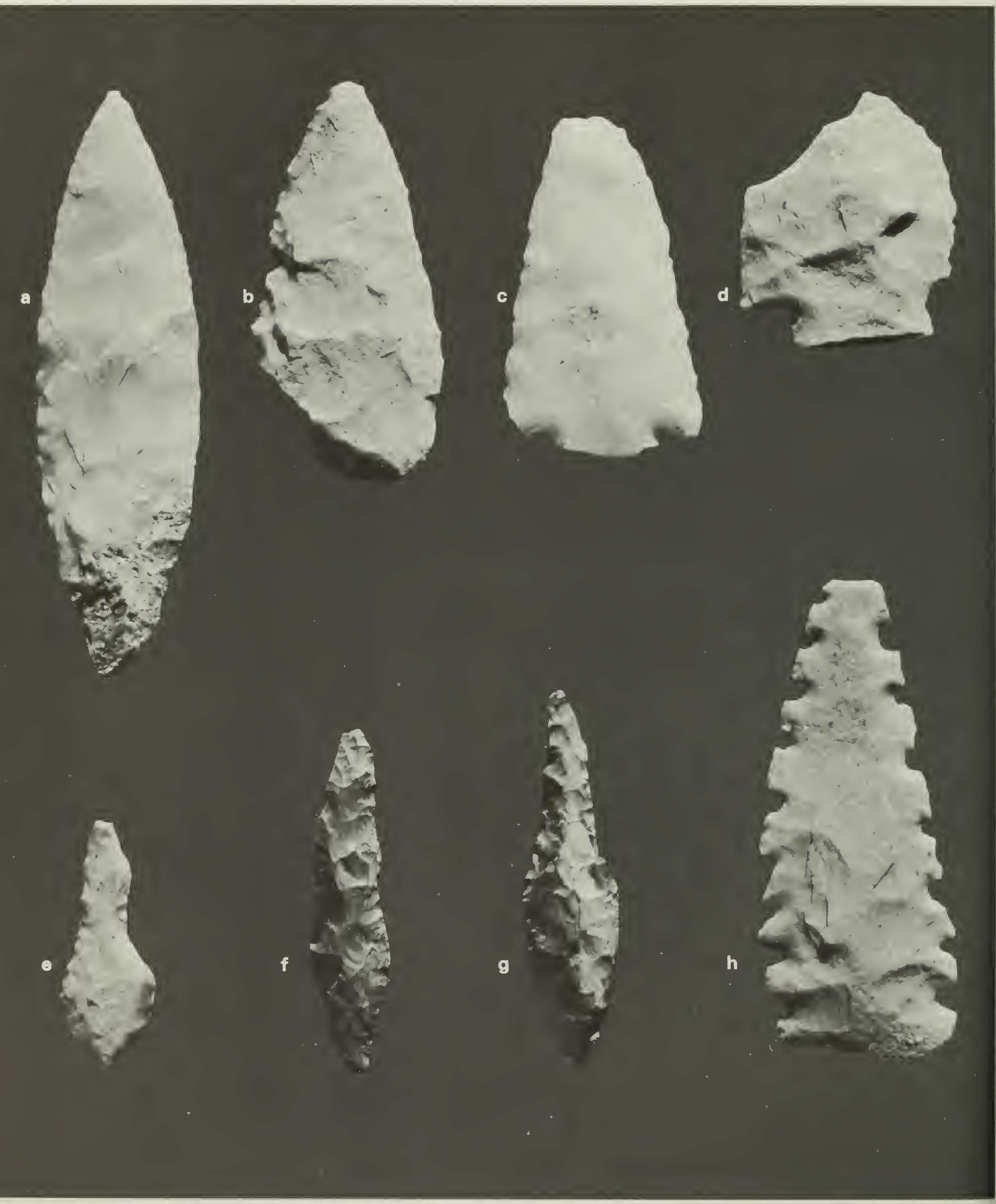
Knives. Cutting tools are required in all phases of the food quest, in gathering materials for making utensils and clothing, and frequently in manufacturing other tools. A knife is defined here as any tool with at least one inten-



253 Chipped stone knives.

tionally prepared, sharp edge.

Twenty-four chipped stone knives found in Mug House may be described under six styles. *Style 1* (figs. 253b–d, g, and 254a)—lanceolate or leaf-shaped. Six have rounded bases and one has a pointed base. *Style 2* (figs. 253a, e–f, and 254b)—subtriangular in shape with three slightly convex sides and markedly rounded corners. Four are relatively short and broad, with a length/width proportion less than 2.1 to 1, while one other is relatively long and narrow, exceeding 2.8 to 1. *Style 3*—subrectangular in shape. *Style 4* (fig. 254c–d)—subtriangular blade outlines with stems or notches. Two have convex



254 Chipped stone knives, a–d, drills, e–g, and saw, h.

sides while one has straight sides. *Style 5*—re-used portions of larger knives. *Style 6*—flakes of various shapes with one or more edges purposely retouched. Five knife fragments could not be assigned to a style.

Quartzite, chert, and chalcedony provided the raw materials as follows:

Raw material	Styles							
	1	2	3	4	5	6	Unassigned	Totals
Quartzite	3	4	1	2	1	1	4	16
Chert	2	1	...	...	1	4	....	8
Chalcedony	2	...	...	1	...	1	1	5
Totals	7	5	1	3	2	6	5	29

Although many of these knives could have been held in the hand, it is probably safe to postulate that some, especially Styles 1, 2, and 4, were hafted. Knives were found in a variety of proveniences throughout the site, all apparently associated with Component C. The single Style 3 knife was found in a niche of Kiva H.

Utilized Flakes. The most common implement employed for cutting purposes was a flake with naturally sharp edges. In fact, most of the stone chipping in Mug House seems to have been aimed at the production of such flakes. From the great mass of chipped stone debris removed from Mug House, more than 400 flakes could be recognized as having been used in one way or another. Of these, 315 were used primarily for cutting.

Although none of these tools were intentionally shaped, several distinct patterns of use along various edges may be distinguished. Fifty-eight flakes, about half of them blades or bladelike flakes, have a rectangular outline with use chipping or abrading on the long sides. Twenty-four squarish flakes show use chipping on three or four adjacent sides. Ten have a long triangular outline with use chipping along one straight side opposite a thick, dull back and end. The great majority, 223 in number, have no particular pattern. Chert, claystone, chalcedony, quartzite, and rarely basalt were the raw materials employed. Flakes utilized for cutting were found throughout the site and in all components.

Chipped Saws. These tools are characterized by the presence of at least one saw-toothed edge. Only one, subtriangular in shape, with two long, convex, serrate sides, was intentionally made (fig. 254h). It is of lavender quartzite and measures more than 7.1 cm. in length and weighs about 12 gm. It was discovered in the upper fill of Room 44 and very likely may have fallen from the second story of that room.

From one to three saw-toothed edges occur on seven irregularly shaped chert flakes in the general size range of the triangular specimen. Two of these came from disturbed fill in Kiva C. The other five flakes came from the trash slope. One of the five was found in refuse of either Component A or B.

Ground Saws. These are relatively small pieces of sandstone concretions or slabs, with one or two thin edges beveled on one or both faces by grinding. They range from 5.5 to 14 cm. in length and from 24 to 490 gm. in weight. Except for the edges to be used, the tools were unshaped. Only eight of them were found scattered in the refuse and rubble throughout the ruin. Tools of this sort would be ideal for cutting small bones and pieces of wood.

SCRAPING TOOLS

Stone Scrapers. One hundred and fifteen scrapers were made on ordinary stone flakes by the simple process of retouching unifacially one or more edges. They show no distinct pattern of shape and size, or character of the working edge. In fact, they are little more than utilized flakes. Many of the retouched edges have notches of various width and depth.

Twenty-three scraper-planes have a flat face opposite the unifacially retouched face. Minute striations and occasional use chips removed from the plane surface identify their use as planes. Twenty of these tools were made from cores, the other three from flakes.

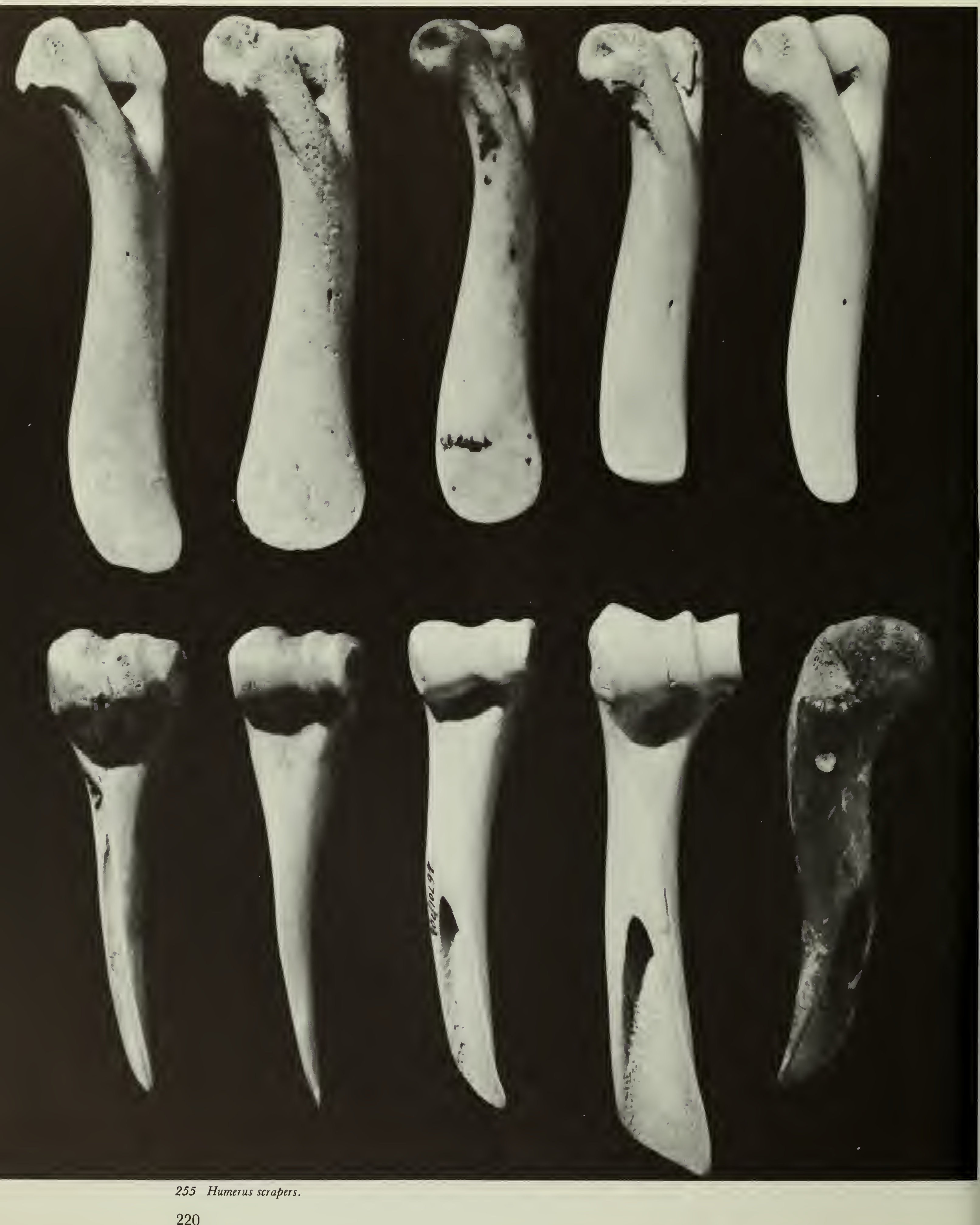
The majority of all scrapers were chert, with only a few of claystone and quartzite. They were found in rubble and refuse deposits of all three components, on room floors, and on banquettes and in niches of kivas. They probably had several functions.

Utilized Flakes. Unifacial chipping on one or more edges, resulting from use in scraping, was recognized on 136 flakes, almost all of which were of chert. The use edges on 12 included one or more notches. Seventeen others had edges that had been dulled or worn smooth through use (Wheeler, 1965). These tools were present in all three components.

Utilized Cores. Sharp edges on 22 cores—21 of chert and 1 of basalt—had been used in scraping, resulting in the removal of tiny chips from one face along each edge. Edges on four of these cores had been abraded (Wheeler, 1965). These utilized cores were found in deposits of all three components. Two of them rested on the floor of Kiva E.

Humerus Scrapers. Although these tools are frequently referred to as "fleshers," it is hard to see how their relatively thin and delicate edges would hold up under such work. The bone implements identified as fleshers at Hawikuh (Hodge, 1920) and at Pecos (Kidder, 1932) have thick edges formed by the intersection of two plane surfaces at a steep angle, and are often marked by teeth or serrations.

The tools from Mug House were made from the distal ends of bighorn sheep and mule deer humeri by cutting the shaft diagonally and then grinding away most of the medial side (fig. 255). Projections and high spots on the remaining articular head were generally ground off, sometimes into the cancellous tissue, to produce a smoother hand grip. Interior edges and surfaces of the shaft were not only ground but also worn by use. The rounded blade ends are always dull, especially the



255 Humerus scrapers.

broad and flaring ones, and they often show beveling on one or both faces (fig. 256). Striations on the beveled facets and on the dulled edges argue against formation of either feature through use alone.

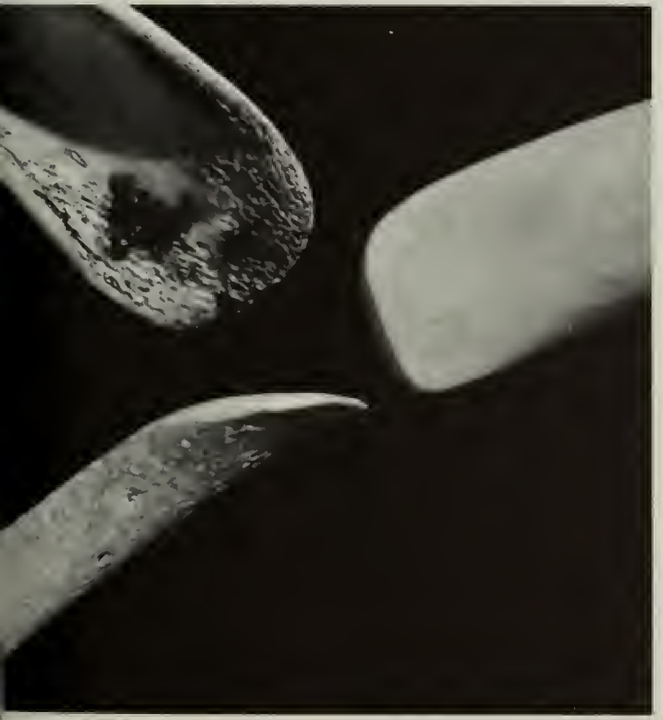
Our excavations recovered 43 bone humerus scrapers. Three others in the Wilmarth collection at the Colorado State Museum and one in the collections of the Mesa Verde Museum bring the study group from Mug House to 47 specimens. Richard Wetherill listed two "B knives" in his first collection from the ruin that are probably humerus scrapers, and Nordenskiöld illustrated one other from Mug House (Nordenskiöld, 1893, pl. XLI, 2).

Bighorn humeri predominate over mule deer, and rights outnumber lefts almost 2 to 1, as shown in the following tabulation.

	Bighorn	Mule Deer	Unidentified artiodactyls	Total
Left humerus	7	5	3	15
? humerus	......	......	5	5
Right humerus	16	9	2	27
Totals	23	14	10	47

At Pueblo Bonito in Chaco Canyon, New Mexico, the group of 20 humerus scrapers contains nearly equal numbers of rights and lefts—9 rights and 11 lefts—but 19 specimens were made from deer bones and only one from a bighorn sheep (Judd, 1954, p. 149). Bighorn sheep may have been more plentiful at Mesa Verde, or bighorn bones may have been acquired regularly by the Muguenos through trade. It is possible that these tools had different specifications at Mug House and at Pueblo Bonito.

256 Blade ends and edges of three humerus scrapers.



Thirty complete and restored scrapers range from 12 to 18 cm. in length and from 44 to 101 gm. in weight. The deer bone scrapers tend to be longer and heavier. No deer bone implement is shorter than 14.5 cm. Widths across the rounded blade vary from 2.3 to 4.3 cm., with the four widest ones of bighorn bones. All of these bones were taken from adult animals.

Two burned scrapers may have had inlaid ornamentation, now lost. In one case, shallow, hemispherical pits had been bored into the two sides of the joint; in the other, the medial surface of the shaft near the joint has a similar depression (fig. 255, bottom row, extreme right). The whittled notch in the joint of the second specimen was probably not intended as an embellishment.

All 47 implements in the study collection came from deposits belonging to Component C. Some were found in trash, but the majority were in the rubble of fallen walls and roofs in rooms and kivas. We encountered none of them on the floors or banquettes of kivas.

On the strength of positive associations with kiva floors and banquettes, I have suggested that some objects may have been used primarily by men. Perhaps the negative association between humerus scrapers and kiva proveniences implies use of these tools primarily by women. In one room at Pueblo Bonito, Judd found the burials of four women, each accompanied by a humerus scraper and an oval basket tray. The other 53 humerus scrapers found by Pepper and by Judd at Pueblo Bonito came from refuse or from rooms, but not from kivas (Judd, 1954, pp. 147–148).

Determinations of how humerus scrapers were used and for what tasks are even more difficult. Neither Pepper, Judd, nor I care to think of them as "fleshers" used to clean animal hides. Not only are the blade ends seemingly too delicate, but they would tend to gouge into the hide. Only one scraper had some substance adhering to it, and this was vegetal material.

Chester A. Thomas, superintendent of Mesa Verde National Park, has told me of the discovery of several humerus scrapers inside corrugated jars at the large Yellow Jacket Ruin, northwest of Cortez. This and the grave associations at Pueblo Bonito seem to imply diverse uses. Experiments conducted in the Wetherill Mesa Project laboratory show that these scrapers are ideal for removing the pulp enclosing the fibers of yucca leaves. They proved to be more effective for this purpose than any other tools of bone or stone that were tried. Perhaps humerus scrapers were a general-purpose scraping tool used in preparing various vegetal materials for food and household commodities.

Tibia Scraper. One scraper was made from a nearly complete left tibia of a mule deer. Its distal joint was unmodified but the proximal end had been cut off on a bevel to produce a thick, steep, concave edge (fig. 257). The uncut surface was beveled by use adjacent to the edge itself. This tool, 25.3 cm. long, could have been used for fleshing animal hides, because it has a thick, strong edge and sufficient length for two hands to grasp it. It was found in the general rubble fill of Kiva F.

Bone Side Scrapers. Three shaft splinters of long bones

257 *Tibia scraper.*

had once-sharp edges along their sides worn smooth through use. Two of them, made from turkey elements, belong to Component C, one of them having been found on the trash slope and the other in Room 71. The third was found in the little storage compartment on the banquette of the Component A kiva. It was made from the left tibia of a deer. Like the humerus scrapers, these tools probably were used on vegetal materials.

Sherd Scrapers. A number of pottery fragments showed signs of having been used as scrapers. There is no evidence of intentional shaping; apparently sherds of appropriate size and shape with a reasonably smooth edge were chosen to begin with. Thirty-four have pronounced convex edges, usually enhanced by the curvature of the sherd, which would be well suited for scraping the interiors of unfired pottery vessels and thinning their vessel walls. Three made from corrugated sherds still retain small pockets of clay in the indentations. The edges on 14 others are either straight or slightly concave and could only have been used on vessel exteriors. One unusually fine specimen, found on the floor of Kiva E, has wear on both convex edges and on one straight edge. All the other sherd scrapers were found in refuse deposits, mostly in the trash slope in front of the ruin.

On two other sherds the abraded edges possess shallow grooves, as if they had been used on narrow strips of material. Both came from the trash slope, one of them from a Component B deposit. Two other sherds were well worn, almost polished on one of the two edges formed by the break. None of these specimens could have been connected with pottery making. They may have been used on softer materials, such as animal hide or plant fibers.

Squash Rind Scrapers. Two fragments of squash rind, one from Room 11 and one from Room 42, were worn on convex edges in a manner similar to the potsherds discussed above. These, too, would have been useful in scraping the interiors of pottery vessels. It seems likely that many more scrapers of this sort once existed at Mug House and have subsequently disintegrated.

PERFORATING TOOLS

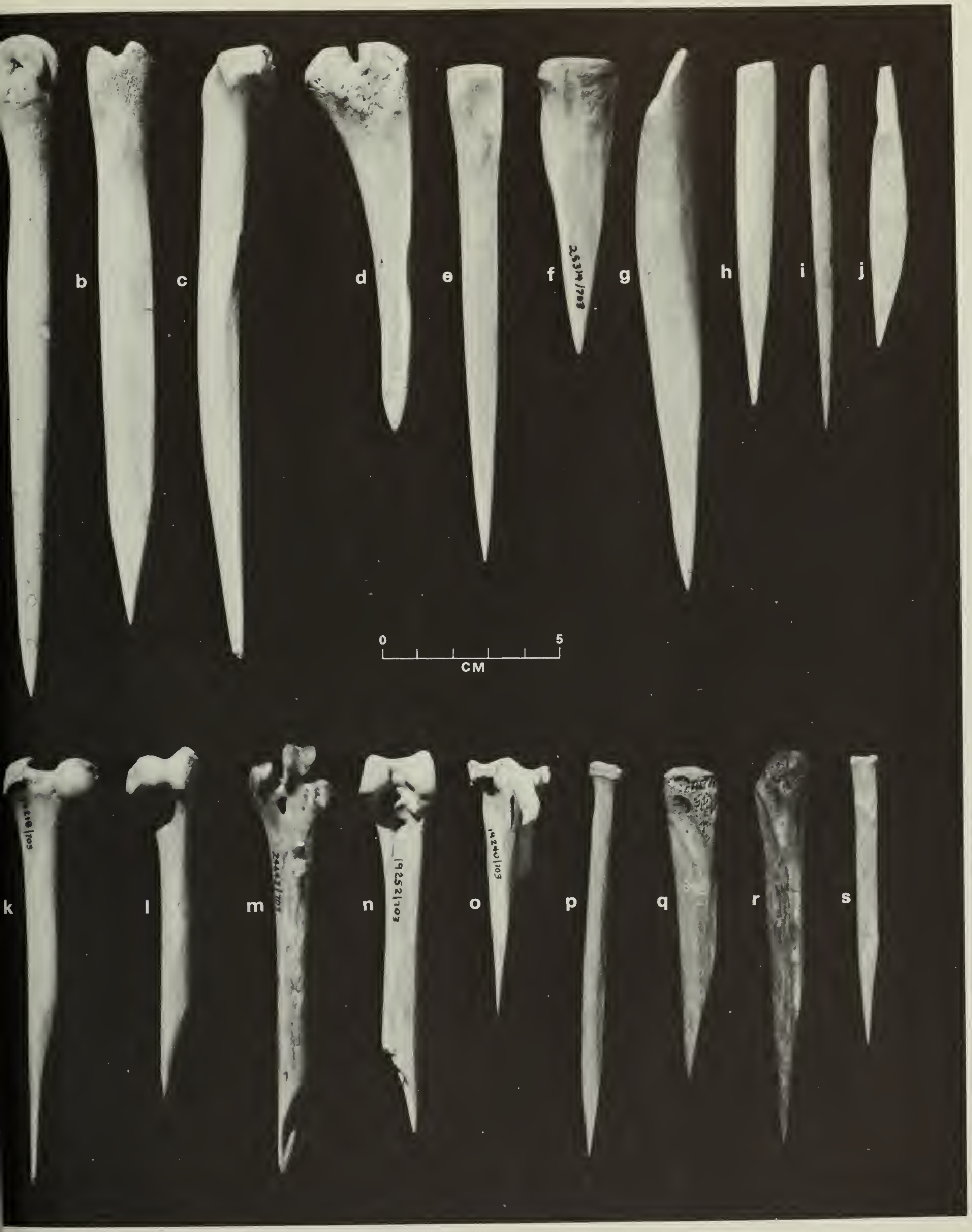
Chipped Stone Drills. The many biconical holes in pottery, ornaments, wood, bark, and other rindlike materials indicate the common use of solid-shank drills. Three specimens had been carefully chipped bifacially to a typical drill shape (fig. 254e–g), with a long, slender, nearly conical bit and a slightly expanded base. They measure from 3.7 to 5.6 cm. in length and from 2½ to 5 gm. in weight. Two were made of chert, the third of quartzite.

Two drills (fig. 254e and g), found in the lower fill of Kiva E and on the floor of Room 71, respectively, belonged to Component C. The third specimen came from the lower fill of the Component A kiva.

Utilized Flake Drills. If relative numbers mean anything, most drilling was done with ordinary stone flakes having a sharp projection. Sixteen of these tools were recognizable only from the wear on the tip of the projection and around its point. Many of these flakes had also been used for cutting or scraping. All were of chert or related materials.

Most of these flake drills came from trash deposits, but a few were mingled in the rubble fills of rooms and

258 Bone awl styles at Mug House. a–b, SC; c–d, SJ; e–f, SR; g–j, SN; k–p, WJ; and q–s, WR. Elements are from artiodactyls, a–h, carnivores, k–l, and turkeys, i, j, m–s.


b
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kivas. One was found on the floor of Kiva E. Apparently all of them belonged to Component C.

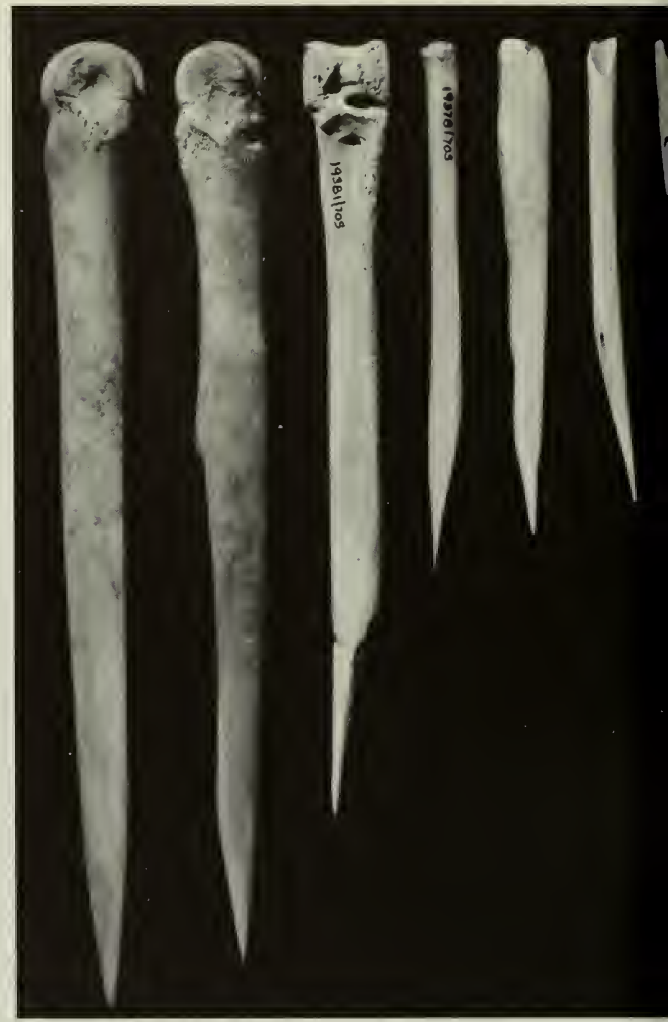
Bone Awls. The most numerous bone implements were awls with sharp, evenly tapered points. As in the case of the manos, bone awls were classified according to their various attributes and the clustering of these attributes. Primary sorting depended on whether the bone was split (*S*) or was whole (*W*). Varying amounts of modification may be seen on the end opposite the point. In some cases, the articular head or joint showed very little grinding or none at all (*J*), whereas on others the joint was largely reduced or almost entirely removed by grinding (*R*). Where none of the cancellous tissue in the joint remains, the awl was essentially made of a splinter (*N*) of the shaft. Because the metapodials or cannon bones of deer and other artiodactyls were so popular among the bone-awl makers of the Southwest, Mug House awls made from this element with easily recognizable heads have been separated from the others (*C*).

The numbers of the various styles of bone awls encountered in Mug House are given in table 28. Several significant patterns emerge. First, over half of the awls were made from bird bones and all but one of these were turkey. Most of these awls were unsplit, and nearly all that were split are splinters. Second, artiodactyl bones were split and only a few retained the articular head without considerable modification. Two of the 13 metapodials were bighorn sheep (fig. 258a–b). All other identifiable artiodactyl specimens in the collection were mule deer except for two bighorn sheep, but a great many bones were not distinguishable between the two species. Third, the carnivore and rabbit bones were unsplit, and in only one was the head considerably worked down (fig. 258k–l). Six of the carnivore bones were bobcat and two were coyote. The elements included three femora, one fibula, three radii, and one humerus.

Awls were found throughout the ruin, both in rubbish and in rooms and kivas. They were lying on the floors, on banquettes, in recesses, and in niches of Kivas G, D, C, E, F, and H. They occurred on room floors much less often. Five of them belong to a kit of seven bone tools placed in the grave with Burial M31, a male (fig. 259). Awls were probably used principally in the manufacture of basketry and the stitching of hides and cloth. Their association with kivas and with Burial M31 suggests that these tasks were performed by men.

TABLE 28.—BONE AWLS

Style (fig. 258)	Bird	Mammal				Totals
		Artiodactyl	Carnivore	Lagomorph	Indet.	
SC (a–b)		13				13
SJ (c–d)	1	5				6
SR (e–f)	1	27			4	32
SN (g–j)	20	4			7	31
WJ (k–p)	49		7	1		57
WR (g–s)	11		1			12
Fragmentary	10	4			5	19
Totals	92	53	8	1	16	170

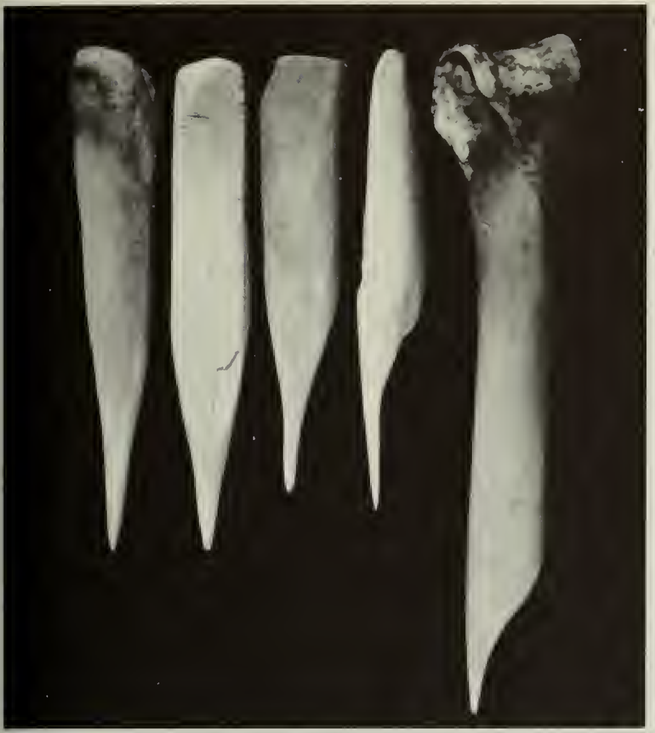


259 Kit of pointed bone tools found with Burial M31.

It is interesting to compare the bones used for awls at Mug House and at Pecos Pueblo, of Pueblo IV-Pueblo V age (Kidder, 1932, p. 202). Turkey bones are much more prominent at Mug House, and splinters are much less common. The overwhelming popularity of metapodials at Pecos—80 percent of mammal bone awls—is quite different from the minor role of metapodials in Mug House. Mammal rib awls and awl-spatulas, like those from Pecos, are entirely lacking here. The dissimilarities in the two collections would seem to reflect differences in cultural values associated with the bone technology practiced by the occupants of these two sites.

Bone Reamers. Reaming tools differ from ordinary awls by having an elongated, slender point that presents a sharply concave outline where it joins the shank of the tool (fig. 260). Minute striations in this concavity indicate that the tool was twisted during use, probably to enlarge a hole made by the sharp point.

Reamers were produced in the same manner as ordinary awls, and they may be described in the same terms (table 29). They were discovered in the same kinds of locations as awls and frequently in association with them.



260 *Bone reamers.*

261 *Bone needles.*

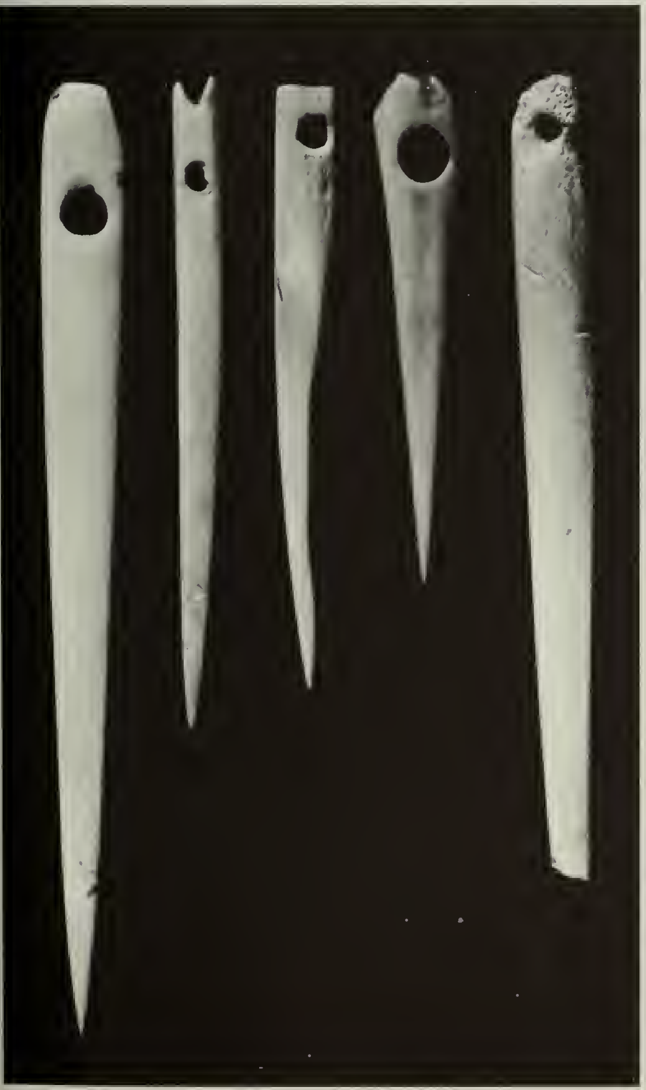


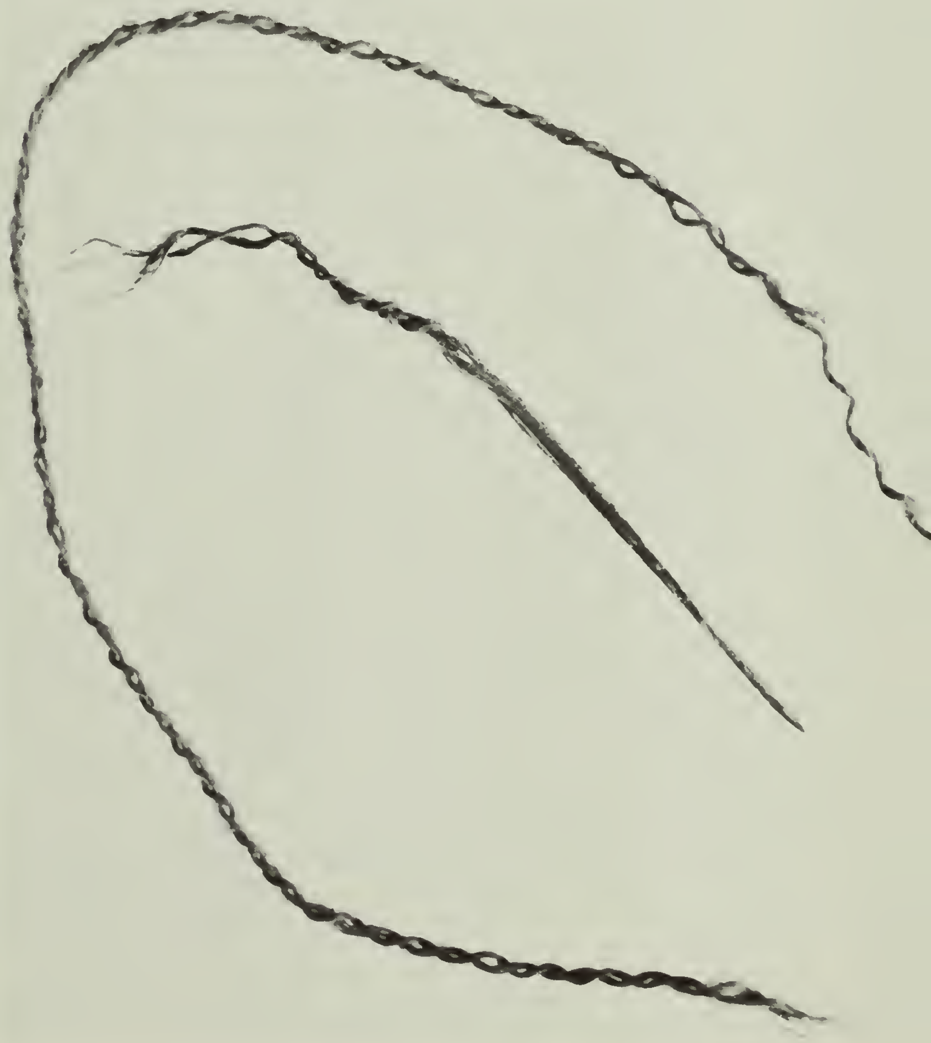
TABLE 29.—BONE REAMERS

Style	Bird	Artio-dactyls	Indeterminate Mammals	Totals
SR	......	3	1	4
SN	1	1	....	2
WJ	6	....	....	6
WR	2	....	....	2
WN	1	....	....	1
Fragments	1	2	1	4
Totals	11	6	2	19

Bone Needles. Four narrow splinters, three from turkey long bones, had a sharp ground point at one end and a biconically drilled hole near the opposite flat end (fig. 261). The sides were ground smooth all around. They ranged from 4.3 to 8.0 cm. in length. One came from the floor of Kiva C, another from the floor of Kiva E, and another from the niche of Kiva F. The fourth may originally have been on the floor of Room 31.

A fifth tool, probably belonging to this class, was made from the second or fifth metacarpal of a large, adult mule deer (fig. 261, right). This slender, solid bone had

262 *Yucca-leaf needle and thread, and length of similar 2-ply* S*-twist cordage.*



been ground to a point on its distal end and biconically drilled near its proximal end. Although the tip was broken off, it falls in the same size range as the four splinter needles. We recovered this tool from the lower fill of Area V. This fill had been brought in by the Indians. It apparently included some redeposited refuse of one of the two earlier components.

Yucca-Leaf Needle and Thread. This handy item for field repair makes use of the sharp natural tip of a yucca leaf for the needle and the attached fibers of the rest of the leaf for cordage (fig. 262). The needle is 4 cm. long. Beyond this, the rest of the leaf was split to a width of 0.2 cm. and stripped of pulp, the resultant fibers being separated into two single bundles and twisted in a Z-twist before being plied together into a fine S-twist thread, 0.1 cm. in diameter. Only 4 cm. of thread now remain attached to the needle; the rest has either been used or broken off. The specimen came from Room 26, which had been almost completely cleaned out by previous diggers. This device apparently saw widespread use in prehistoric times throughout the San Juan drainage and even into southern Arizona (Kent, 1957, p. 489).

Wooden Awls. Six sticks (fig. 263) and one splinter had been worked to a sharp point at one end, like the bone awls. Five were made of fendlerbush, one of mountain-mahogany, and one of chokecherry. The last is the only one retaining its bark. They range in length from 11.7 to more than 24.3 cm. The ends opposite the points were smoothly finished off into small knobs on all three specimens where these ends were still intact. The back end of the splinter was simply smoothed over. All seven wooden awls were found in the general rubble of the ruin. We can assume that they served the same purposes as bone awls. One broken specimen of fendlerbush has prominent nodes, one of which could have acted as a shoulder for an arrow foreshaft (fig. 263, second from left). However, its tip is well polished, as would be expected from use as an awl.

263 *Wooden awls (six specimens from left) and punch (extreme right).*

Wooden Punch. A stick of fendlerbush, similar to the awls just described but only 6.5 cm. long, has a blunt flattened tip and a rounded opposite end that is somewhat burred from battering (fig. 263, extreme right). It came from the rubble fill of Room 44.

WEAVING TOOLS

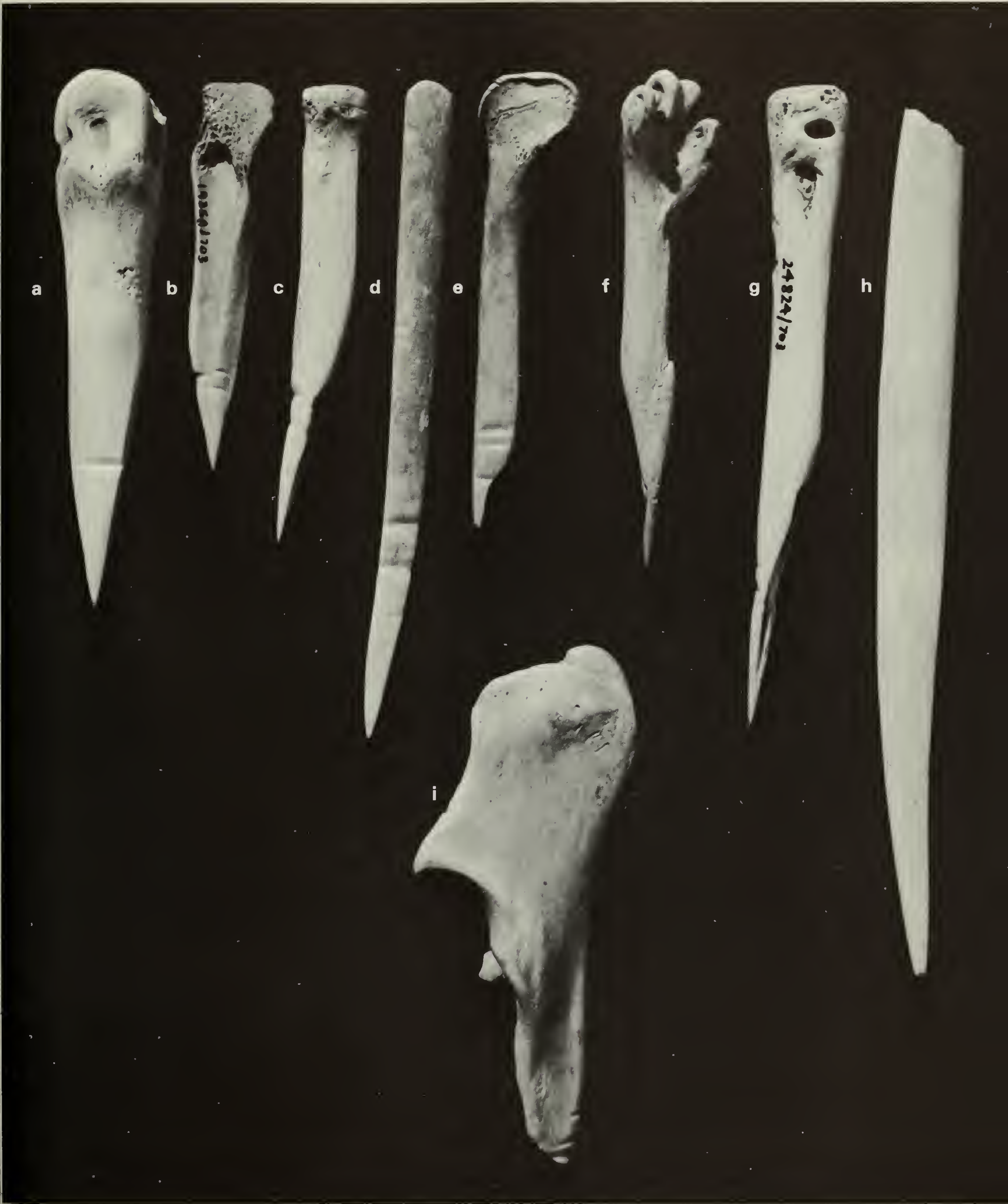
Bone Awls with Transverse Grooves. These tools can be distinguished from ordinary awls by the presence of highly polished, shallow, transverse grooves at varying distances up the shaft from the point (fig. 264a–g). Frequently, grooves are matched on opposite sides of the shaft, but often not. The high degree of polish extends from the grooves to the adjacent portions of the shaft.

These grooved awls have been analyzed in the same manner as the ungrooved awls (table 30). The same styles were made and the same associations of styles and source elements may be seen. The observations of Hodge (1920, pp. 102–106) and Kidder (1932, p. 227) indicate to me these grooved awls were probably weaving tools, although Carolyn and Douglas Osborne disagree. They feel the grooves may have been produced by manipulation of the sewing elements while making coiled baskets.

Again like the ordinary awls, grooved awls were found in deposits of all three components, although those associated with Components A and B had all been made from elements of mammals. Within Component C, they occurred on the floors and banquettes of kivas and on room floors, as well as throughout the trash. They were

TABLE 30.—BONE AWLS WITH TRANSVERSE GROOVES

Style	Bird	Mammal			Totals
		Artio.	Carn.	Indet.	
SC		2			2
SR		5		1	6
SN		1			1
WJ	11		1		12
WR	5		2		7
Fragmentary	4	4		3	11
Totals	20	12	3	4	39


a
b
c
d
e
f
g
24824/703
h
i

264 Bone awls with transverse grooves, a–g, matting (?) tool, h, and weaving tool, i.

265 Wooden battens.

invariably associated with ordinary bone awls, and one belonged to the kit of seven pointed bone implements found with Burial M31.

Bone Matting (?) *Tool.* A single broken specimen had the flattened tip and limited wear near that tip which Kidder (1932, p. 227) suggested would be useful in lifting various elements during the manufacture of plaited yucca baskets or plaited rush matting (fig. 264h). The tool was made from a splinter of long bone belonging to a relatively large mammal. It was found in the lower rubble fill of Kiva F and thus may originally have lain in the courtyard above or in one of the surrounding rooms.

Bone Weaving Tool. This exceptional implement was made of the proximal end of the right ulna of a mule deer (fig. 264i). It had no sharpened point, and the tip resembles a crude hook because of a deep groove worn into one side adjacent to the tip. This is the only bone tool in the Mug House collections made from the ulna of an artiodactyl with the large joint essentially intact. Its position in the lower part of the trash slope does not permit assignment to one of the three components.

Wooden Battens. Two specimens have both the shape and the wear characteristic of implements used by weavers to beat down the wefts (fig. 265). The one complete specimen is made from a sliver of juniper, 22.6 cm. long by 4 cm. wide and 1.3 cm. thick. Both ends, one of them slightly charred, have been beveled by grinding or use, in one case to a rather sharp edge. Both sides show considerable wear along their narrow edges. A minimum of smoothing has been applied to the already naturally smooth face and to the other broken face. Whatever splintering may be seen on the object at the present time appears to be a result of post-use damage.

The second specimen represents only one end of a batten made from mountain-mahogany, probably about the same size as the whole one. In this case, every surface and edge has been ground smooth while both sides and one remaining end show the high polish of use. This piece came from the disturbed fill in Room 11. The complete tool was found in an old backdirt pile overlying Kiva E, and could have been associated with the loom loops in Room 45/2 immediately adjacent. Both battens are of a size that would fit nicely in a girdle-back loom for narrow fabrics.

Wooden Spindle Whorl. About one-half of a circular whorl made from ponderosa pine was recovered from refuse beneath a missing section of floor in Room 31. All faces and edges had been ground smooth and a cylindrical hole, 0.7 cm. in diameter, had been drilled in the center (fig. 266). The object is 8.3 cm. in diameter, and tapers from 0.7 cm. thick at the center to 0.4 cm. thick at the edge.

266 Fragment of a wooden spindle whorl.

COMPOSITE TOOLS

Utilized Flakes. Although most of the utilized flakes had been used either for cutting or for scraping, 39 showed evidence of both cutting and scraping. In addition to sharp cutting and scraping edges, 14 flakes bore projections that had been considerably worn and dulled, probably through use in engraving or incising. Like the other utilized flakes, these multiple-use tools were made primarily from cherts and claystones and were widely scattered throughout the Mug House fill.

Rubbing and Pounding Stones. These are subrectangular or ovoid cobbles that display typical use polishing from rubbing on one or both faces as well as some battering on ends, sides, and corners. They seem to be intermediate between ordinary rubbing stones and the pitted pounding stones. Cobbles of granitic rock, quartzite, and hard sandstone were generally selected. They ranged from 6.5 to 18.5 cm. in length and from about 130 to over 2,000 gm. in weight. Eight of the 10 specimens were found in refuse deposits, one of them belonging to Component B. The other two were found in disturbed deposits filling two previously dug spaces.

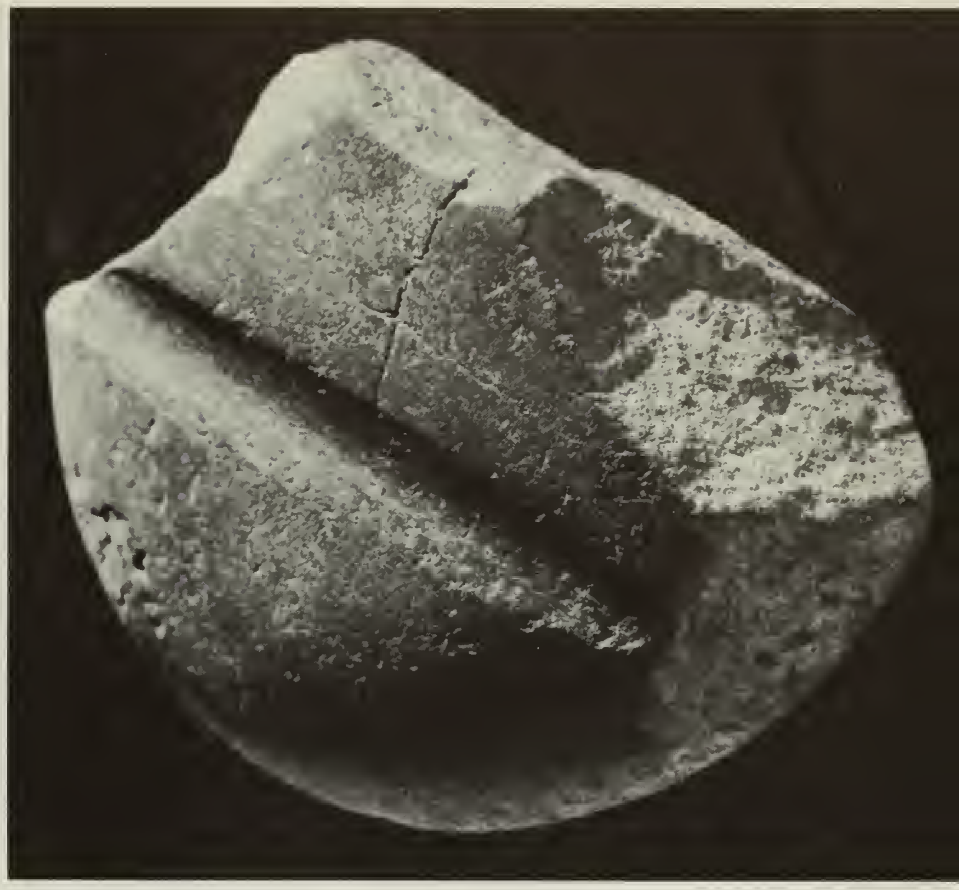
MISCELLANEOUS TOOLS

Lapstones or Anvils. Six large, virtually unmodified cobbles of coarse-grained igneous rock and hard sandstone could have provided firm surfaces to work on or against. In all cases, the relatively flat faces are somewhat polished and exhibit some scattered dimpling near the center. In our laboratory experiments with the preparation of yucca fibers for cordage, we found these cobbles to be very useful as rests for the yucca leaves as they were scraped by various pulping tools. This process would account for the polishing, but not for the dimpling, of such cobbles. The latter must be the result of blows struck on objects held against the lapstone.

All the cobbles are relatively flat, from 3.7 to 6.3 cm. thick. They range in size from 14.8 by 25.2 cm. to 30.4 by 39.4 cm., and in weight from 2,596 to 12,322 gm. (more than 27 pounds).

Two of these lapstones were found on the surface of the ruin, where they may have been left by previous excavators. One came from the lower rubble fill of Kiva F; another was found in the horizontal ventilator tunnel of Kiva B; and another was mudded into the floor of Kiva E, near the southeast wall. The sixth had been broken into two or more pieces; one-half of it was found on the floor of Room 24/1. All of these stones must have been carried from the gravel deposits of the Mancos River, a good distance to the south. Their large size and weight must have made them valuable.

Shaft Straighteners. Only two objects of this class were found. A complete specimen of hard sandstone contained a shallow, rounded groove 1.1 cm. wide and 0.2 cm. deep on the convex surface (fig. 267). This object came from the northeast corner of Courtyard A. The second specimen with a similar groove, made of volcanic glass, is represented only by a fragment. It was recovered from the lower part of the trash slope.

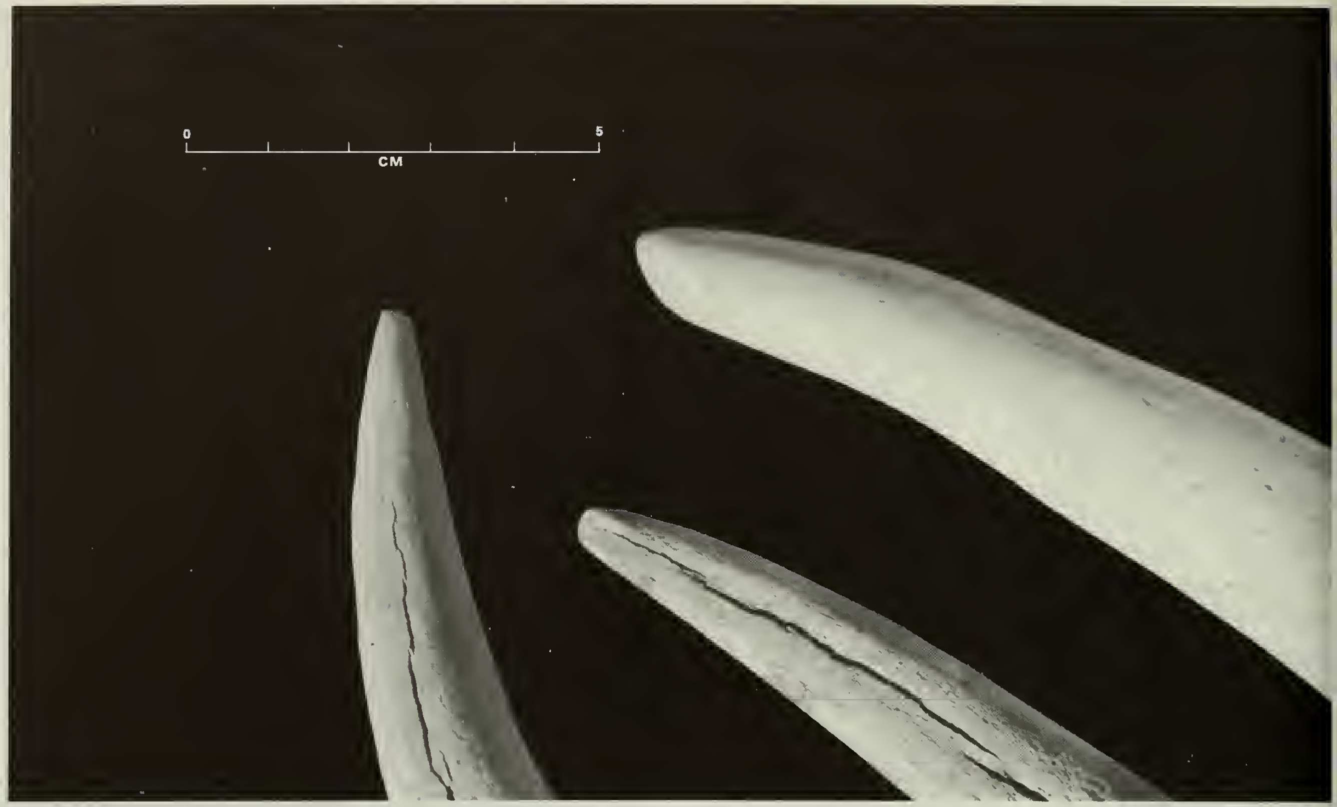


267 Stone shaft straightener.

Bone Spatulas. Spatulas are differentiated from scrapers by their relatively long, thin, flat blade with a sharp edge. Morris (1939, p. 122) calls similar objects chisel-like end scrapers or fleshers. Actually chisels have thick edges formed by worked faces intersecting at a steep angle, while the faces on these tools meet at a very low angle. The blade edge would tend to gouge a hide while removing flesh from it.

We found only six spatulas in Mug House, and one of these is merely a blade fragment. Four were made from four different elements of artiodactyls (fig. 268). A broken one found in Room 37 was made from the split proximal end of the left radius of a mule deer. Another, found on the floor of Room 22, was made from the distal portion of a mule deer's right tibia with one side of the shaft split away (fig. 268, center). Still another was formed by cutting away the lateral side of a mule deer humerus, as opposed to the medial side, which is cut away from the humerus scrapers (fig. 268, left). This tool was recovered from backdirt that must have come from one of the rooms in the north end of the lower cave. A fifth spatula was made from a split section of a bighorn metacarpal, and was recovered from the upper fill of Room 44 (fig. 268, right). The sixth, and the most unusual, spatula was made by cutting away on the diagonal the distal end of a turkey's left scapula.

The turkey bone spatula came from the Component B refuse layer of the trash slope. The five spatulas made of mammal bones definitely belonged to Component C.

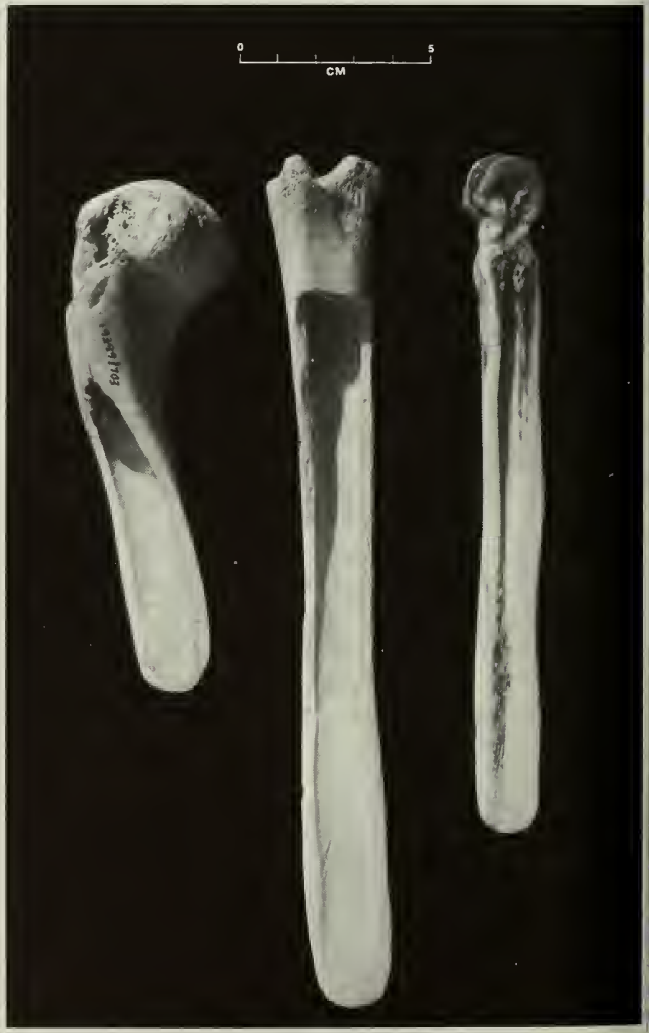


269 *Worn tips of three antler flakers.*

The specific function of these tools is unknown, unless one assumes the uses to which modern spatulas are put.

Antler Flakers. Three antler tines, ranging in length from 14.5 to 25 cm., were blunted at their tips from use (fig. 269). A polish caused by handling, probably while in use, covered the parts of the shaft immediately adjacent to the tips. The opposite ends were unmodified.

Because it is relatively soft and resilient, antler has been selected almost universally by primitive craftsmen for chipping stone tools by pressure. The Mug House specimens exhibit signs of wear exactly where they would be expected from such use. The largest and finest piece was found on the north banquette of Kiva E; the other two came from disturbed fill in Room 6 and overlying Kiva E.



268 *Bone spatulas.*

CHAPTER 10

household equipment

Any object of material culture that serves a practical purpose in a house may be considered part of the household equipment. This excludes such things as agricultural tools and hunting paraphernalia, which are carried afield to be used. Clothing and adornment are also excluded since they pertain to the individual rather than the household. Because they were so numerous and varied in form and size, utensils and tools have already been considered in separate chapters. Thus this chapter will cover furnishings and objects that serve the household.

MATS AND MATTING

Willow Mats. Apparently the commonest form of matting in Mug House consisted of groups of long, straight willow sticks laid side by side and sewed with yucca cordage. These sticks or rods, ranging in diameter from 0.6 to 1.1 cm. and rarely peeled, were pierced at intervals from 7.5 to 14 cm. and strung on series of yucca cords that were then knotted at both ends to keep the sticks from sliding off. Large rods were frequently split before being strung, but the smaller rods were used whole and ground flat on the upper surface. Both split and whole sticks occurred in the same mat. The ends of each rod were generally rounded and slightly beveled by grinding. Occasionally, perforations for the cordage were only 2.5 cm. from the ends of the rods, although normally the perforations were 8 to 10 cm. or more from the ends. Each perforation invariably split the rod lengthwise for a short distance in each direction.

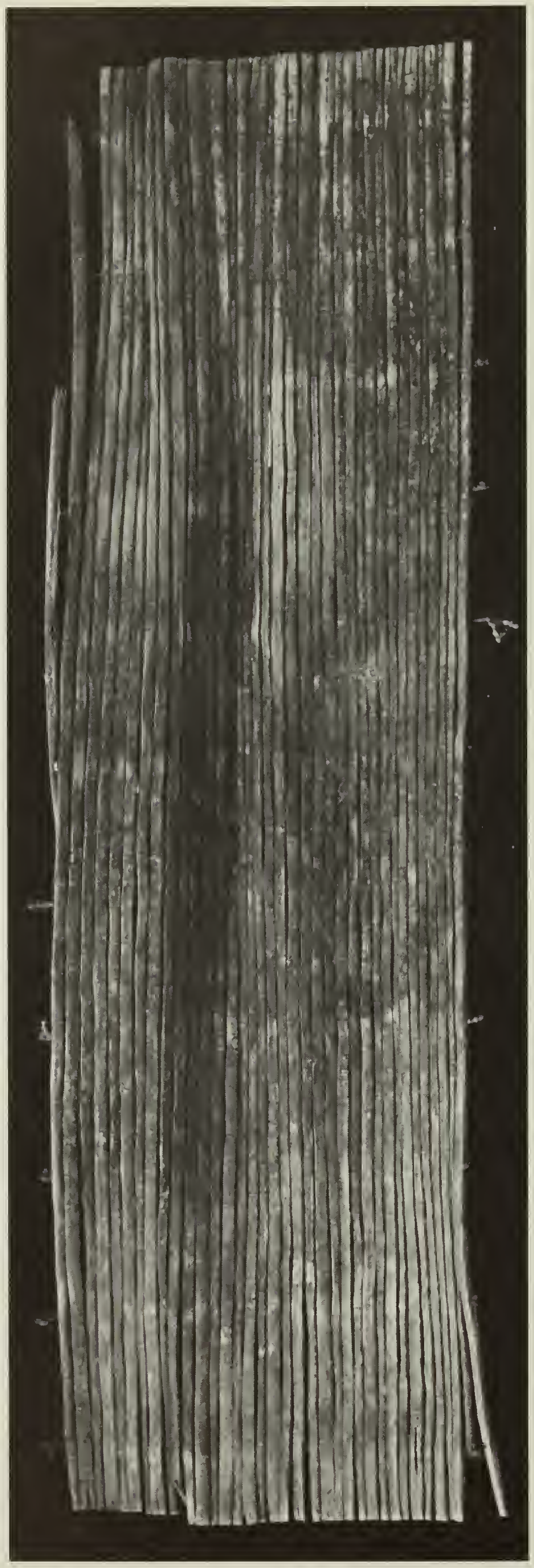
Several parts of mats and many loose willow rods were found throughout the various deposits in Mug House and Adobe Cave. Pieces of at least eight separate mats can be recognized. The most nearly complete specimen (fig. 270) was found wrapped around a partly mummified head (Burial M2) in Adobe Cave. It consisted of 37 unpeeled willow rods, flattened on one surface and rounded on both ends, strung on 11 2-ply Z-twist yucca cords spaced 10 to 11 cm. apart. The finished width of the mat, equal to the length of the individual rods, is a little more than 114 cm. (45 inches). Its present length is 33 cm. (13 inches), although it was longer at one time. It averages about 0.7 cm. in thickness.

Two other graves contained fragmentary willow mats. Seven partly rotted sticks are all that remain of one that accompanied Burial M1 in Adobe Cave. The 34 loose rod pieces with Burial M36, if laid side by side, would represent a mat about 30 cm. (12 inches) wide.

The only other reasonably large fragment of a willow mat was found in the badly disturbed rubble filling Kiva C. All that remains intact are 17 rods, up to 49.5 cm. (19½ inches) long, strung on 5 yucca cords spaced about 8 cm. apart (fig. 271). One end and one side are intact. The present length is only about 15 cm. (6 inches). However, scattered in all of the rubble in Kiva C and in adjacent spaces was a total of 84 loose rods, all about the same size and style; that is, whole rods flattened on one side with the same interval between perforations. Probably these all belonged to the same mat, which would then have contained at least 101 rods with a minimum length of about 91 cm. (36 inches).

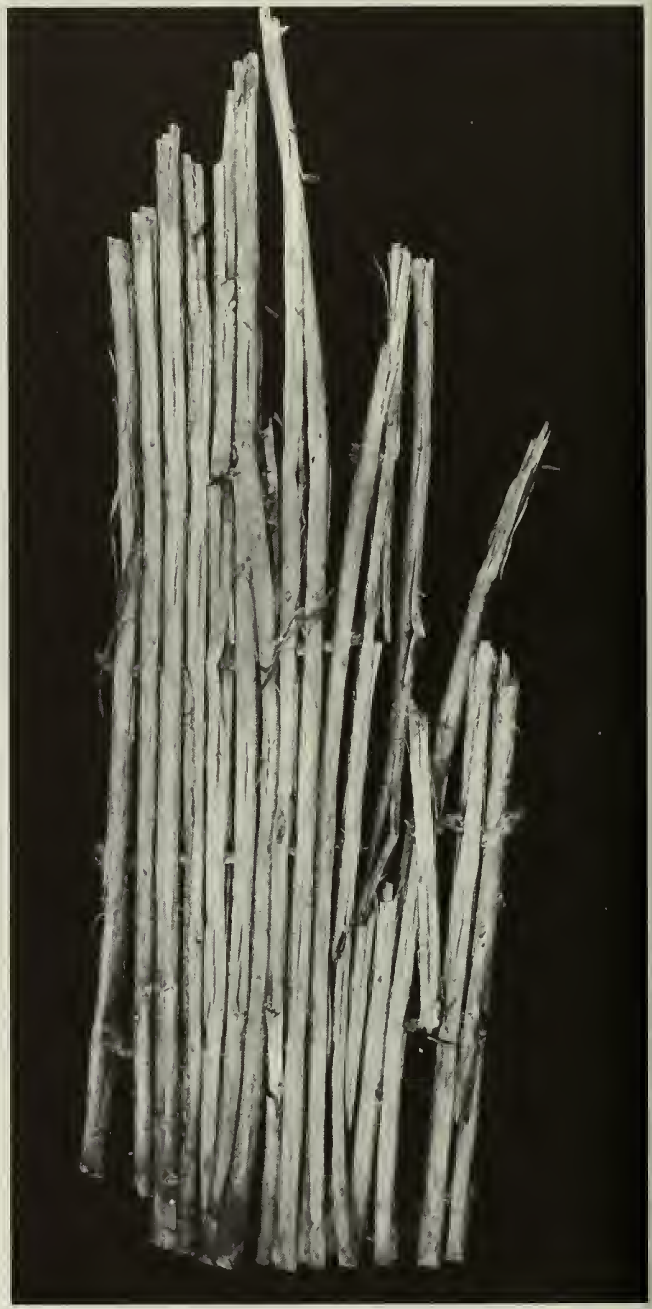
A fifth mat is represented by 56 loose sticks from the rubble in Room 44, representing a width of about 51 cm. (20 inches). More than 40 loose rods in the pile of old backdirt that had been tossed from the upper ledge on top of Kiva D belong to a sixth mat that may have been about 35 cm. (14 inches) wide. From the fill of Room 23 came four rods, still held together by one piece of cord, and three loose rods. Four more rods from Kiva B, two of them still held together, represent the eighth mat.

Quite likely, willow mats were a common accouterment of all the rooms and kivas of Mug House, for, in spite of both the earlier collecting in the ruin and the limited dry conditions for preservation, some 312 individual rods were recovered during our work. Laid side by side these pieces would produce slightly more than 9 feet of matting.



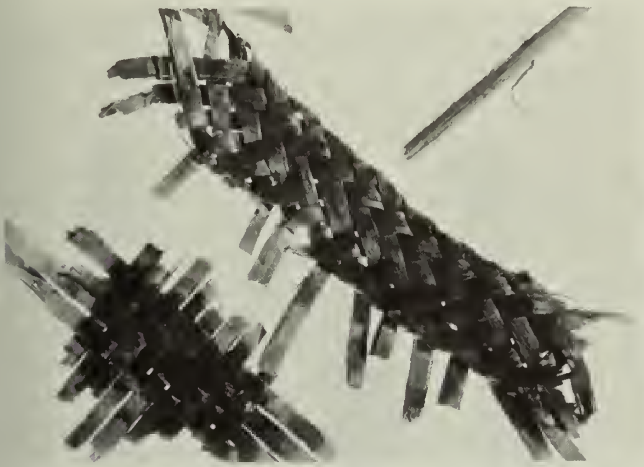
270 *Fragment of a willow mat found with Burial M2, Adobe Cave.*

271 *Fragment of a willow mat from disturbed fill in Kiva C.*



Extensive impressions of this kind of mat on the floors of Kiva B and Room 19 show that willow mats were used in both rooms and kivas and suggest that they may have served as a general floor covering in any space where people were likely to sit or lie on the floor. At least fragments of them were present in all burials where any sign of perishable materials remained, and they may very well have formed the standard casing around corpses to be laid away. It is also possible that some of these mats were hung as a screen or curtain, such as the door covering found at Aztec Ruin, in northwestern New Mexico. Certainly the two loops above the south doorway to Room 11/2 indicate that this opening was closed by a hanging of some sort rather than by an ordinary door slab (see discussion of doorways in ch. 3).

Twilled Rush Matting. Fragments of three over-2 under-2 twilled mats made from rushes (*Scirpus* sp.) were uncovered during our excavations. These were probably like the complete specimen from the early Wetherill collections in the Colorado State Museum (report being prepared by Carolyn M. Osborne). One fragment includes part of a diagonally twilled selvage braid, 2.7 cm. in width (fig. 272). Two of the finds on the floors of Rooms 26 and 31 indicate that this kind of mat was also used as a floor covering.



272 Fragments of twilled rush matting, and a reed with twine through it.

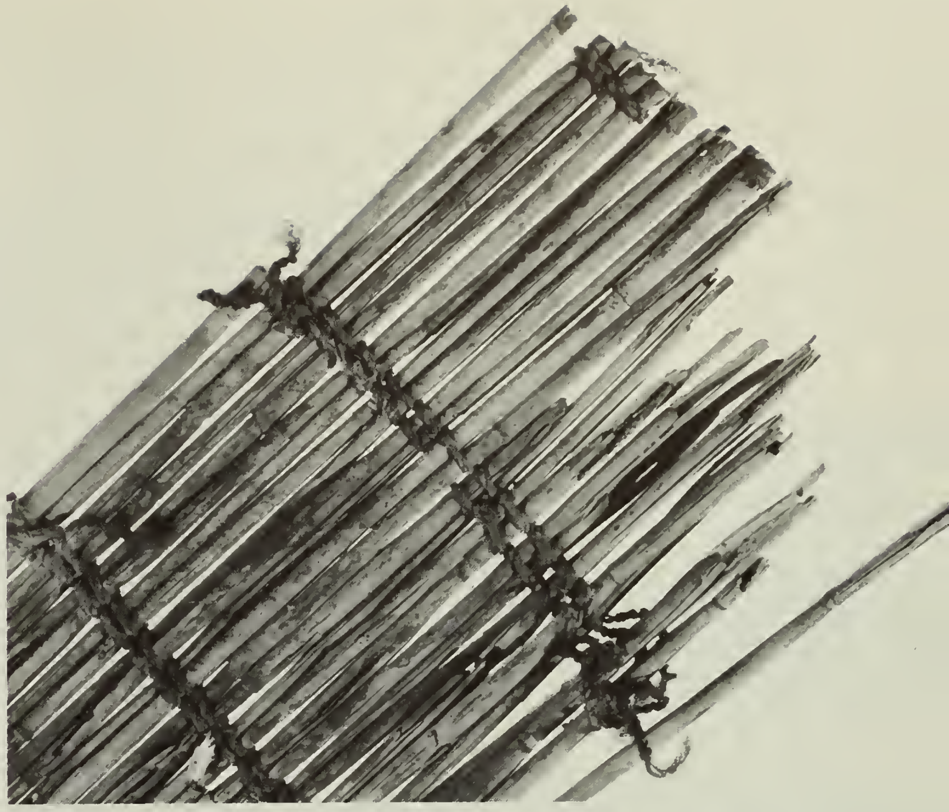
Reed Mat. Among the items from Mug House in the Mesa Verde Museum (Fewkes-Jeep collection) is a fragmentary twined mat of reeds (fig. 273). Twenty-seven reeds, up to 47 cm. long, are held by five double rows of wefts of 2-ply Z-twist yucca cords. The present width is 16 cm. (6¼ inches). The weft pairs in the double rows exactly parallel each other, catching two warps in each twist with a discernible pitch up to the left when viewed horizontally.

The weft pairs lie from 8 to 10 cm. apart, with one pair next to the finished end. Here each reed is broken off about 0.5 cm. beyond a joint, thereby helping to prevent splitting from the ends and increasing the durability of the finished product. However, every other set of wefts catches the same two reeds while alternate pairs divide each of these groups of two, thus interlocking all the warps in the mat (fig. 274).

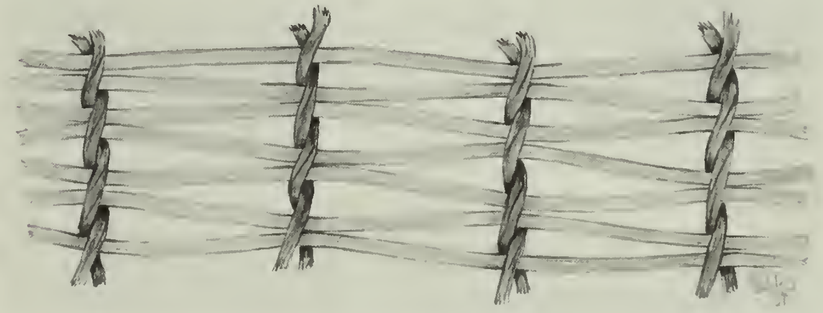
A large quantity of reeds came from various dry deposits in Mug House. Many of these had been broken or cut off just a short distance beyond a joint, and one wonders if these may have been raw material for similar mats. Many stalks, on the other hand, seem too thin for such purposes. One loose stem had been pierced in two places, 13 cm. apart, as if it were to be strung on cords in the same manner as the willow rods already described (fig. 272, upper right). One of the perforations still contains a piece of 2-ply Z-twist cordage, 0.1 cm. in diameter.

CRADLE

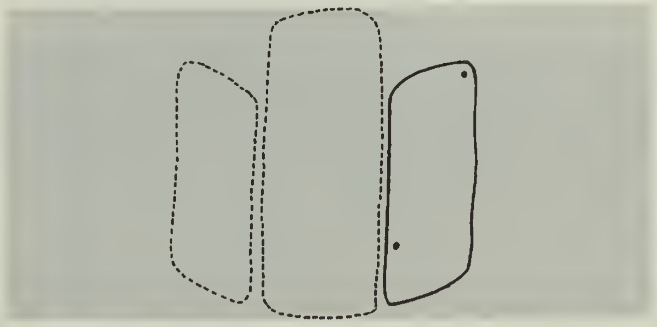
A small pine board found in the rubble fill of Room 44 was probably the sideboard of a wooden cradle, as shown in figure 275. It measured 35.3 by 11.0 by 1.4 cm., and was ground smooth on both surfaces and all four sides, with its maximum thickness in the center. It has two biconically drilled holes, one in one corner and one along the opposite side about one-third of the way from the opposite end. The side hole still contains a fragment of yucca cordage. Opposite the second hole is a shallow, worn notch, as if some wrapping had consistently passed over this spot. Cradles of this type are illustrated by Watson (1953, p. 175).



273 Fragment of a twined mat of reeds from Mug House in the Mesa Verde Museum collections.



274 Diagram of twining technique of reed mat shown in fig. 273.



275 Sketch of wooden cradle elements. The element indicated by solid lines was found in the rubble fill of Room 44.

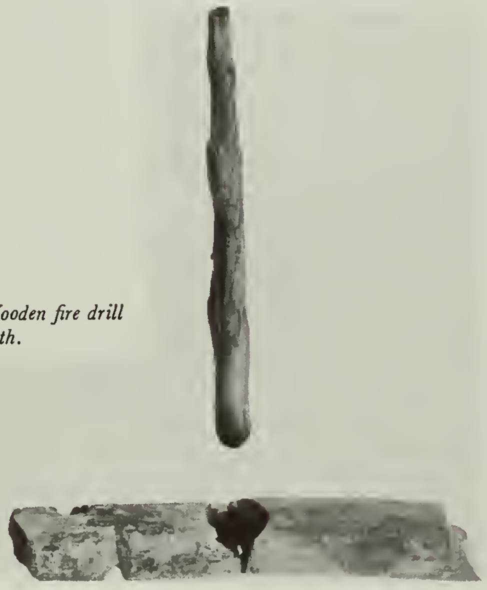
WOODEN PILLOW

In 1935, a badly decayed but once well finished billet of wood was found with Burial M1 in Adobe Cave. It was made of pine, with one flat and one convex surface and two rounded ends. In spite of the decomposition, its form has been maintained by adobe, which appears to have replaced some of the decayed parts. It measures 33 by 10 by 4.5 cm. (13 by 4 by 1¾ inches). Guernsey (1931, p. 107, plate 62a, c) illustrates two similar objects which he refers to as pillows because one was found in position with a mummy's head resting on it. The Adobe Cave specimen lay over the head of Burial M1, which, in turn, lay on its right side. The "pillow" would have been in its proper position beneath the head had the burial been laid on its left side. While being wrapped, the body may have lain on its left side with the pillow beneath its head, but then was turned onto its right side when laid in the ground.

FIRE-MAKING EQUIPMENT

Without the convenience of modern matches and mechanical lighters, primitive people are careful to keep fires burning. If necessary, they can usually find a way to borrow fire. Occasionally, however, a religious ceremony or some other circumstance requires that fire be freshly kindled.

The standard fire-making apparatus in Mug House seems to have been the simple stick fire drill rotated by hand in a notch cut into a second piece of wood or hearth (fig. 276). Only four actual specimens were recovered—two drills and two hearths—all from deposits that had been previously burned. Although the four pieces were widely scattered, they seemed to make up two sets. The slightly charred end of the smaller drill fits and rotates perfectly in one of the holes of the smaller hearth. Both were made from sagebrush. Similarly, the larger fire drill, made from serviceberry, fits perfectly into one of the holes of the larger hearth, which was made from wood of the poplar family. There is no evidence on either drill of turning by means of a bowstring or other device.

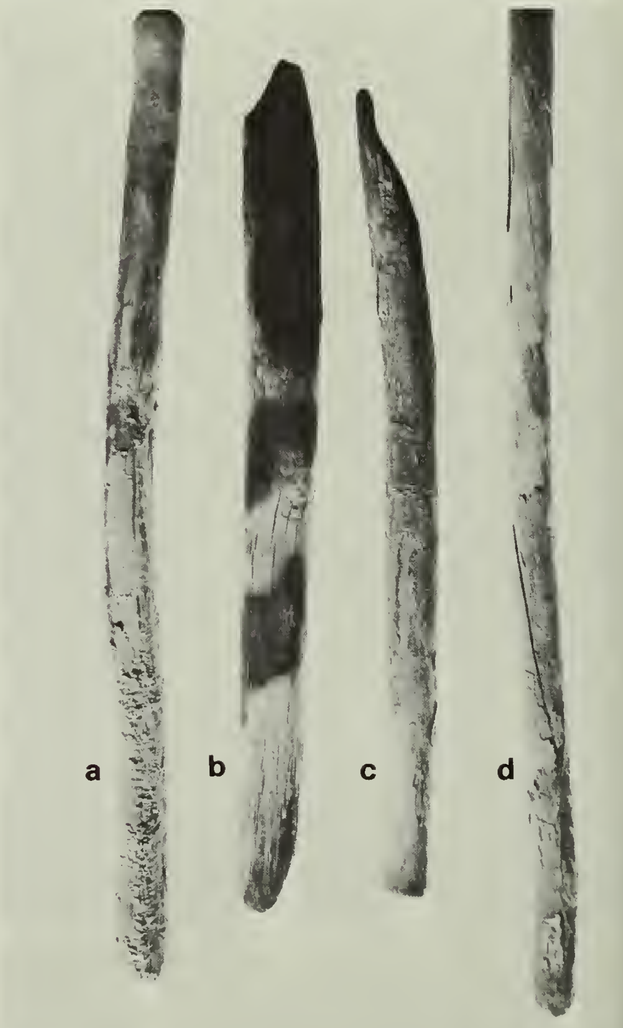


276 Wooden fire drill and hearth.

Some kind of slow match must have been used to transfer fire from one fireplace to another, or from one house to another. The Mug House collections contain 9 whole cornhusks, charred down to the ear base, and 11 grass crowns with the leaf blades charred off, which may have served this purpose.

WOODEN STIRRING PADDLE

This tool is a split oak twig, peeled and ground smooth, and partly coated with buff-colored plaster or mortar (fig. 277a). It is very slightly curved and measures 40.2 cm. (16 inches) in length. Like most of the other perishable objects, it was found in fill that had been worked through several times by previous diggers.



277 Wooden stirring paddle, a, and pokers, b–d.

WOODEN POKERS

Seven sticks found throughout the disturbed deposits have one or both blunt ends slightly charred, as though they had been used as pokers (fig. 277b–d). Nothing else had been done to them beyond stripping the bark from four and smoothing over some of the rough spots. Three of the four complete specimens range in length from 33.5 cm. (13 inches) to 35.6 cm. (14 inches), while the fourth measures 78.6 cm. (31 inches). Both ends are charred on three of them.

Two mountain-mahogany sticks with forks at one end may have served as pokers. Neither stick was peeled, but the forked ends were worn smooth and one was charred. The forked ends would be useful for manipulating hot objects in or over a fire. Used together, the pair would make efficient tongs. The charred stick, 34 cm. (13½ inches) long, came from Room 31, and the other, 36 cm. (14 inches) long, from rubble fill in adjacent Kiva C.

WORKED SANDSTONE SLABS

Thin slabs of sandstone found many uses in "finishing" rooms and in helping to furnish them. Niches, doorways, and other wall openings were often at least partially lined with slabs; bins and some hearths were built of them. Slabs were also made into pot covers, doors, and plugs, or served to cover niches or ventilators and other wall openings. Door slabs and jar lids, easily recognized by their size and shape, have been discussed, respectively, in ch. 3 and ch. 8.

Thin beds of hard sandstone in the Mesaverde group produce slabs. Some slabs had been shaped by spalling along the edges and by grinding the edges and faces, but a great many slabs had been used without alteration. Only nearly complete specimens were saved.

Because we could not tell for sure how slabs other than pot covers, door slabs, and paint-stained slabs were used, we classified them by shape and size rather than function. The most common form (44 specimens) virtually duplicates the long, rectangular shape of typical manos, were it not for such differences as the selective grinding treatment of the flat faces to remove rough spots, the almost complete absence of pecking, a general unevenness of the surface, frequent extreme thinness, and slightly larger average size. Thirteen other slabs ranged in size between these and the small door slabs, and approached a square shape. Four others were crudely rounded, averaging about 30 cm. across.

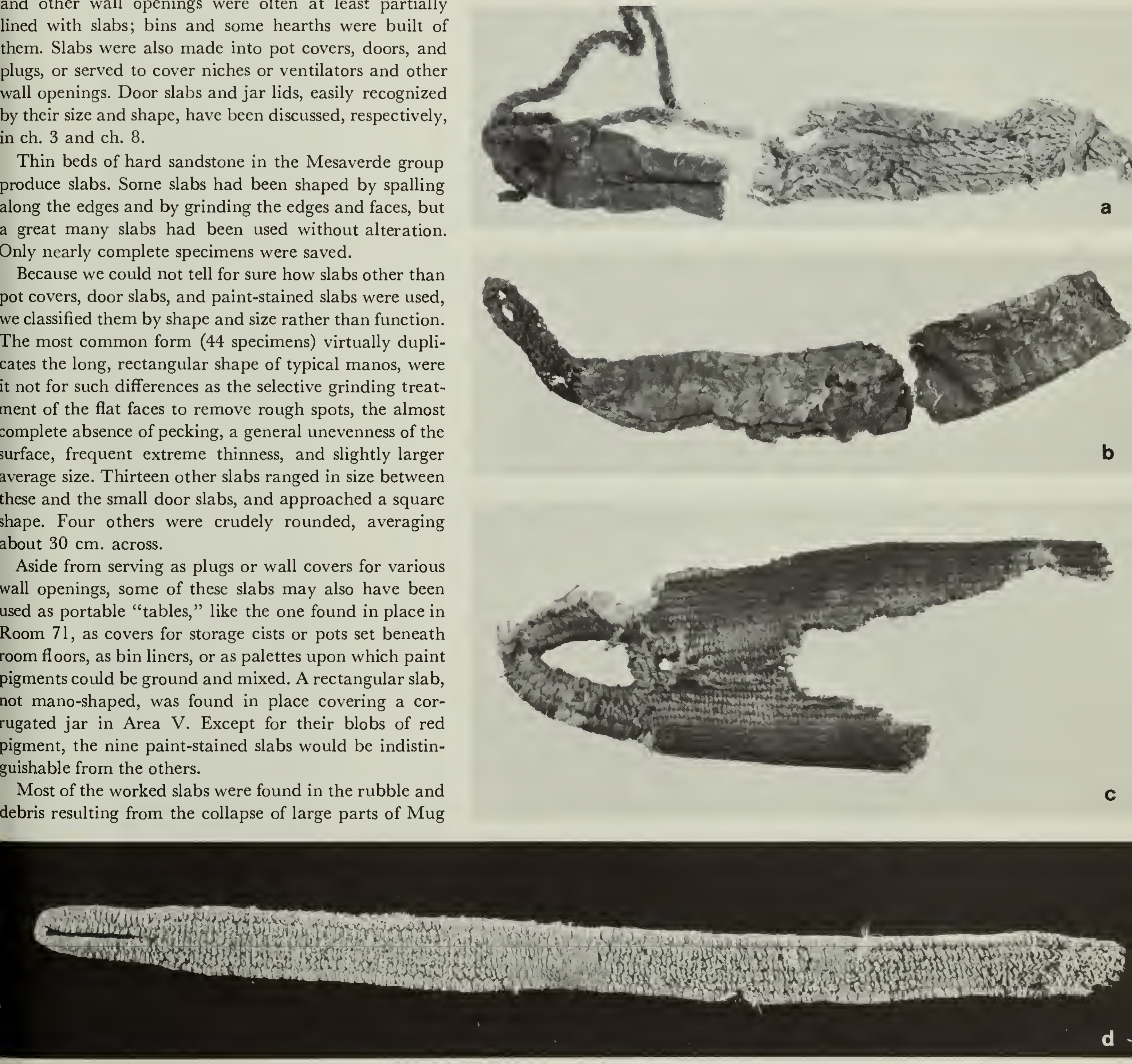
Aside from serving as plugs or wall covers for various wall openings, some of these slabs may also have been used as portable "tables," like the one found in place in Room 71, as covers for storage cists or pots set beneath room floors, as bin liners, or as palettes upon which paint pigments could be ground and mixed. A rectangular slab, not mano-shaped, was found in place covering a corrugated jar in Area V. Except for their blobs of red pigment, the nine paint-stained slabs would be indistinguishable from the others.

Most of the worked slabs were found in the rubble and debris resulting from the collapse of large parts of Mug House. Several, however, were found on room and kiva floors. The three paint-stained slabs that seem to have been in place came from Kivas E, F, and G.

TUMPLINE HEADBANDS

Like many American Indians, the Pueblo Indians carried back packs by attaching the carrying straps to a band that passed across the forehead. Parts of six headbands, no two exactly alike, are in various collections from Mug House.

278 Tumpline headbands.



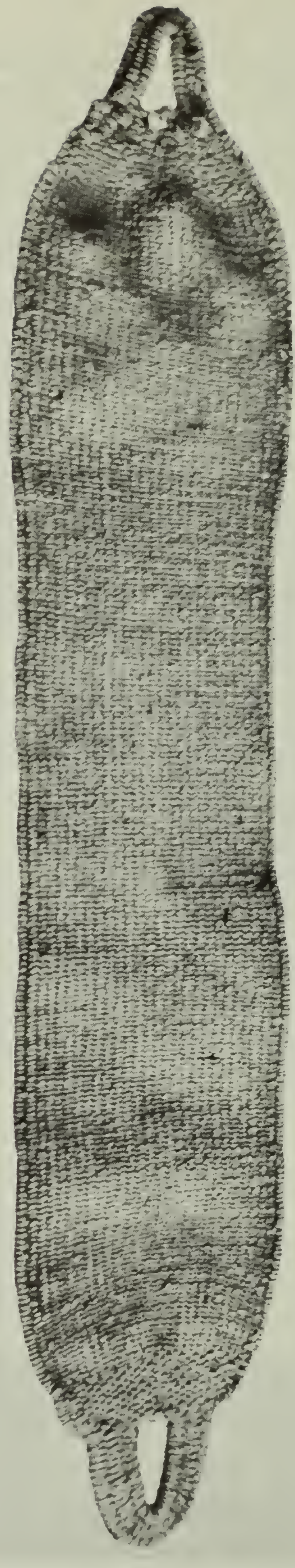
The ends of a hide-covered band lay on the floor of Room 3 (fig. 278a). Even minus a midsection, their combined length exceeds 25 cm. (9¾ inches); the maximum width is around 4 cm. A continuous hank of 2-ply Z-twist yucca twine, 0.3 cm. in diameter, forms a 9-warp foundation which is held in place 2 cm. from each end by a single row of twining using 2-ply Z-twist cord about 0.2 cm. in diameter. The foundation was then covered with a piece of hide, sewed in place down the middle of one surface, using more yucca twine. Fragments of 3-ply Z-twist rope, 0.7 cm. in diameter, are still attached to the loops at both ends by means of clove hitches. Each of the plies in these ropes consists of a 2-ply S-twist twine.

A second hide-covered band, also in two fragments, was found in the fill of Room 37 (fig. 278b). With one end missing, the combined length of the two pieces approaches 29 cm. (11¼ inches) and it, too, was 4 cm. wide. The foundation of yucca twine seems to be identical to that of the band from Room 3, although there is no evidence of a row of twining near the loop. The edges of the hide wrapping overlap about 2.5 cm. on one surface and are held in place by three lengthwise rows of running stitch made with 2-ply S-twist cotton yarn. The hide is too poorly preserved to be identified, but its thickness indicates that it probably belonged to a large mammal, possibly deer.

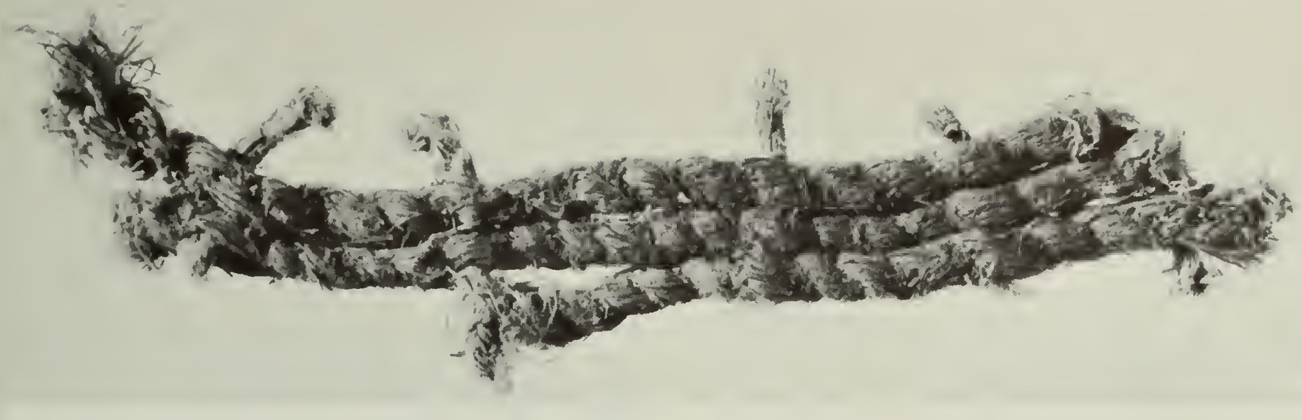
From the fill of Kiva B came one end of a twined band, 17 cm. long (6¾ inches) and 6 cm. wide (fig. 278c). There are 24 warps of 2-ply S-twist yucca twine about 0.1 cm. in diameter, through which 2-ply S-twist cotton wefts were twined with a pitch up to the right when viewed horizontally. The wefts average nine pairs per centimeter. For the loop, two groups of 12 warps are gathered into three bundles that are held together by plain over-1 under-1 weaving. A break at the base of the loop has been crudely mended, using 6-ply S-twist cotton yarn. The dark stain still visible on much of the band may be the result of a combination of sweat and dirt.

The refuse just north of Kiva A yielded most of a narrow twined band now measuring over 29 cm. (11½ inches) long and only 3.3 cm. wide (fig. 278d). It was made with only six warps of yucca twine separated into two groups of three for the loop. The twined wefts are pitched up to the right. This band is too narrow to ride comfortably across the forehead unless some kind of pad was used. Several complete specimens of tumplines in the collections of the Colorado State Museum consist of a combination of a narrow strap and a broader band.

A complete twined headband was taken from Mug House during the last century and is now in the Wilmarth collection at the Colorado State Museum (fig. 279). It has a total length of 43 cm. (17 inches) and is 7.7 cm. (3 inches) wide. Twenty-eight yucca cord warps were woven with 2-ply S-twist cotton wefts averaging 0.2 cm. in diameter. The twining wefts are pitched up to the right and average six pairs per centimeter. Toward each end the warps are caught in pairs for about 1.7 cm., then formed into three bundles coming from each side to form loops. Center warps are cut off at the bottom of the loop. The two warps along the sides also appear to be double.



279 Tumpline headband from Mug House in the Wilmarth collection Colorado State Museum.



280 Three lengths of twine sewed together in same manner as willow rods.

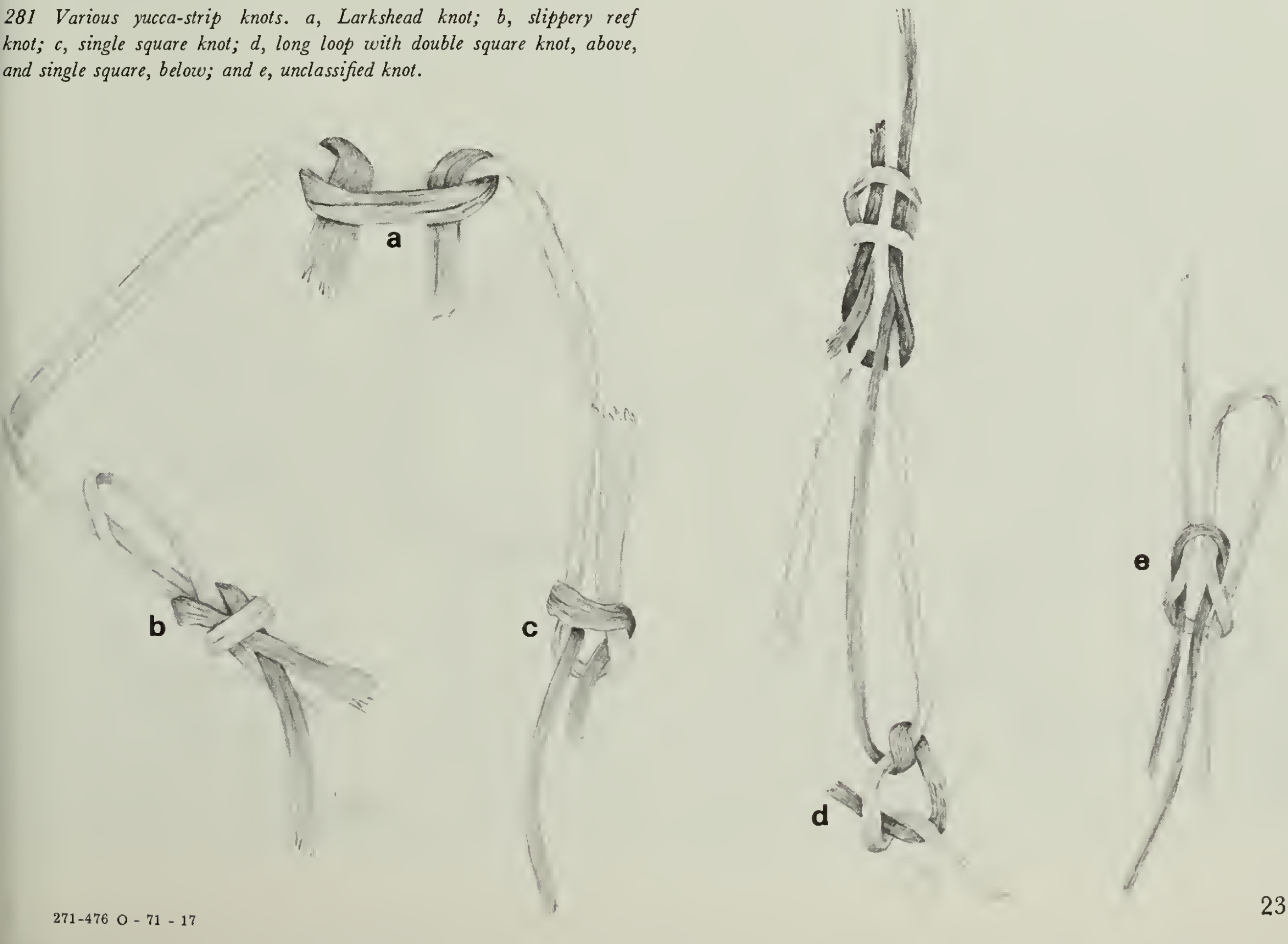
There is a sixth band in the Nordenskiöld collection in the Finnish National Museum at Helsinki. Notes made by Charlie Steen in 1960 describe the band as four thick, 2-ply yucca cords doubled to give a width of eight cords and sewn together by a small yucca cord in the same manner as the willow rods in a mat. This technique is well illustrated in a small fragment from the tunnel to Kiva B, which retains only three 2-ply Z-twist yucca cords, each 0.3 cm. in diameter, sewn together in four places with a finer 2-ply Z-twist yucca twine (fig. 280). The overall length of this fragment is only 8.7 cm.

The Nordenskiöld band measures slightly more than 60 cm. (23½ inches) long and 2.5 cm. wide. Very heavy 2-ply yucca cords, one 37 cm. long and the other 45 cm. long, are attached to the loops at each end. The piece had evidently been folded, tied, and put away when it was not being used.

The three woven tumplines from Mug House could have been made on girdle-back looms. Such looms may have been attached to small wall loops in Rooms 9 and 45/2. Many loose scraps of cordage appear to have once been part of similar bands or may have been intended for inclusion in them.

YUCCA STRIPS AND KNOTS

Yucca-leaf strips were used to tie up bundles, fasten construction items together, make rude carrying nets, and so forth. These strips were split from the leaves of the broad-leafed plant (*Yucca baccata* Torr.), which grew everywhere on the mesa tops or in the canyons of Mesa Verde. They were strong, but drying made them brittle. The strips could not be re-used once they had lost their flexibility.



281 Various yucca-strip knots. a, Larkshead knot; b, slippery reef knot; c, single square knot; d, long loop with double square knot, above, and single square, below; and e, unclassified knot.

The leaves of the broad-leafed yucca may reach 70 cm. (28 inches) in length, and a single strip is thus limited by the length of the leaf from which it is split. To obtain greater lengths, the Indians knotted shorter strips together. Most of the knotted fragments recovered from Mug House are less than 30 cm. (1 foot) long.

The Mug House excavations produced 381 plain strips and 463 knotted strips of yucca. The latter include:

396 single square knots joining two strips end to end (fig. 281c–d).
38 pieces with two square knots joining three strips end to end.
2 pieces with three square knots joining four strips end to end.
1 piece with four square knots.
12 strips with self overhand knots.
1 bow knot.
1 larkshead knot (fig. 281a).
6 slippery reef knots (fig. 281b) (Graumont and Hensel, 1946, p. 64, fig. 69 and pl. 26).
2 granny knots joing two strips end to end.
1 double square knot (fig. 281d).
1 long loop (fig. 281d).
1 running eye knot (Graumont and Hensel, 1946, fig. 66 and pl. 26).
1 unclassified knot (fig. 281e).

The last four are unusual variations of square knots.

The plain strips and the strips with one and two square knots may be classified by width, as follows:

Width	Plain strips	Strips w/1 knot	Strips w/2 knots
0.1–0.2 cm	19	26	....
0.2–0.4 cm	130	135	8
0.4–0.8 cm	193	169	23
0.8+ cm	39	66	5

The narrower strips, less than 0.4 cm. wide, were most often used for sandal ties or for mending various fabrics. Constant tying and untying of the sandal ties would soon cause them to break, but replacements were only as far away as the nearest yucca plant.

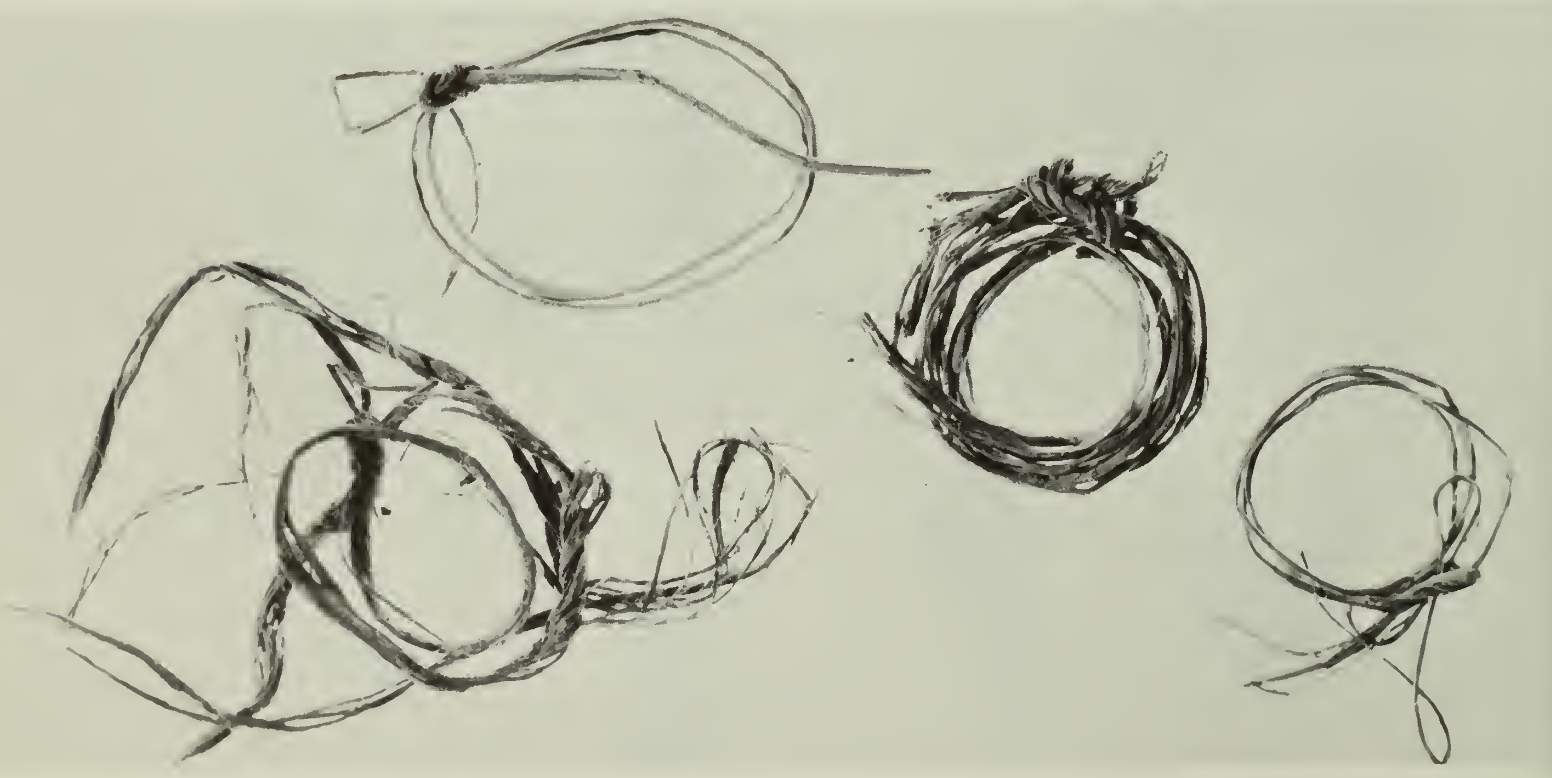
Yucca strips were often used to bind objects together or into bundles. We found several intact wrappings (fig. 282). The majority (24) consist of a single wrap fastened with a square knot; eight have two wraps and a square knot; four have three wraps and a square knot; and two have four wraps and a square knot. One strip had been wound around its object eight times (fig. 282). Nine wrappings employed two strips in a single wrap with two square knots; two others were wrapped twice with two strips. Objects may have been suspended from elongate loops (fig. 283). Construction materials were sometimes held in place with yucca strips. One loop which was recovered free in the rubble obviously once held two sticks, each about 3 cm. in diameter, at right angles to one another (fig. 283).

Ears of corn were strung together on yucca strips for storage. The peduncle of each ear was pierced and the strips passed through. Several strips were tied end to end for each string of ears.

Remnants of carrying or harness nets were found loose in the rubble (fig. 284a) and around two of the corrugated jars, but the latter were too badly damaged by moisture to permit their recovery. These nets tended to use the wider strips.

Thirteen chains with two to six loops were found in the rubble fill of several scattered rooms and in the refuse of Area V. The flat loops of these chains, ranging from 0.5 to 3 cm. in diameter, were formed around objects with overhand knots that would have been grannies if pulled tight (fig. 284b). If the maker had intended the

282 Yucca-strip wrappings, probably bundle ties. Second wrapping from the right consists of eight loops.

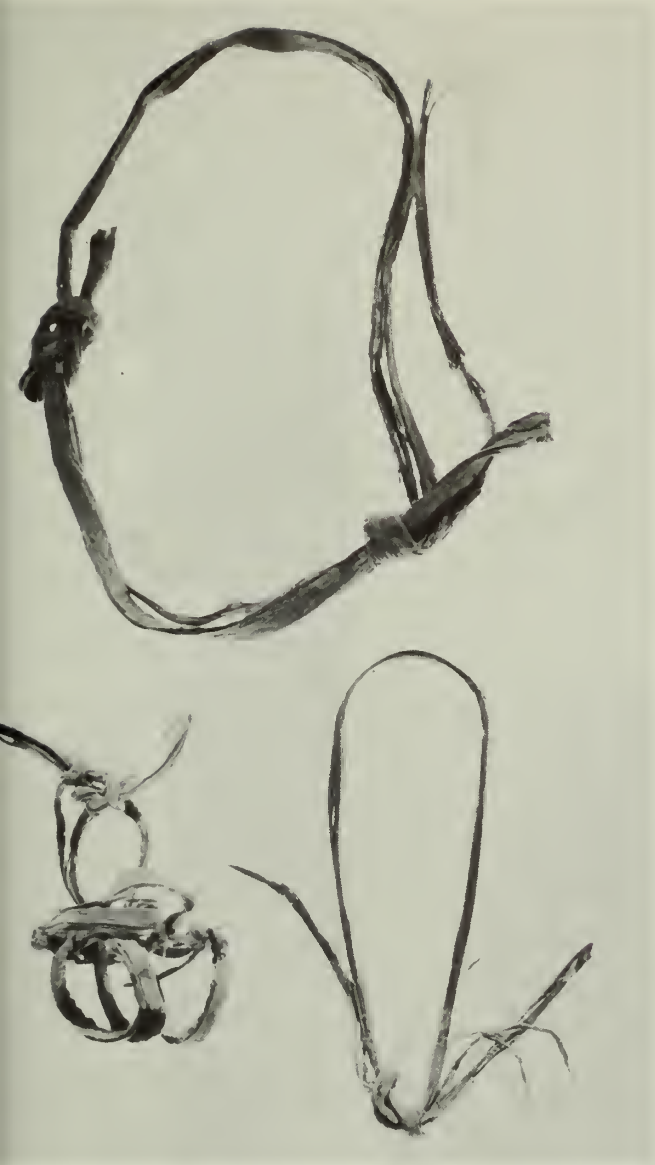


loops to be pulled tight, he would have been careful to tie the customary square knots.

A nearly complete length of Nelson sennit, 5 cm. long and 0.9 cm. in diameter (fig. 284d), could represent mere "doodling," but more likely served as an ornamental object. A second incomplete braid (fig. 284c) may have had a similar purpose; it was found in the rubbish of Area V.

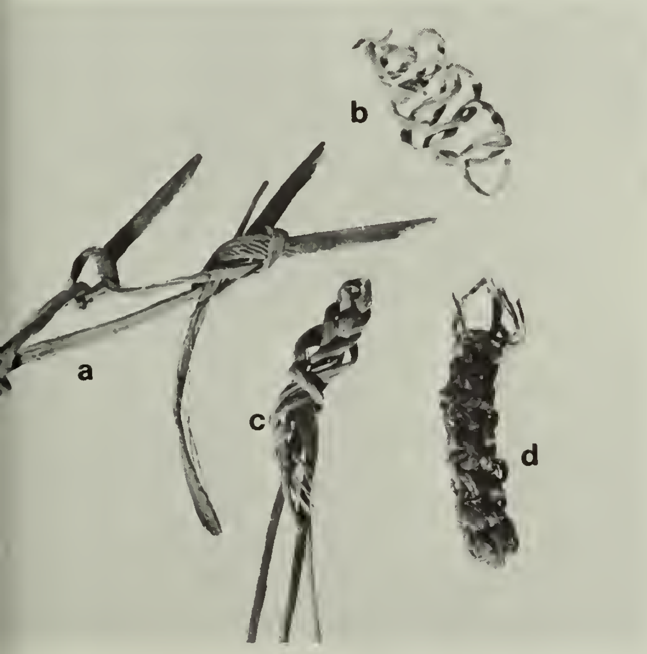
Slippery reef or slippery square knots produce an eye loop for easy tightening and release. Four knots, all variations on the standard square knot, may have been tied by accident or as experiments.

Although leaves of the narrow-leafed yucca (*Yucca harrimaniae*) went into the making of twilled sandals and twilled headrings for carrying jars, parts of this plant are extremely rare in our collections from Mug House. Four leaves came from Room 44 and one nearly complete plant from Room 33 (fig. 285).

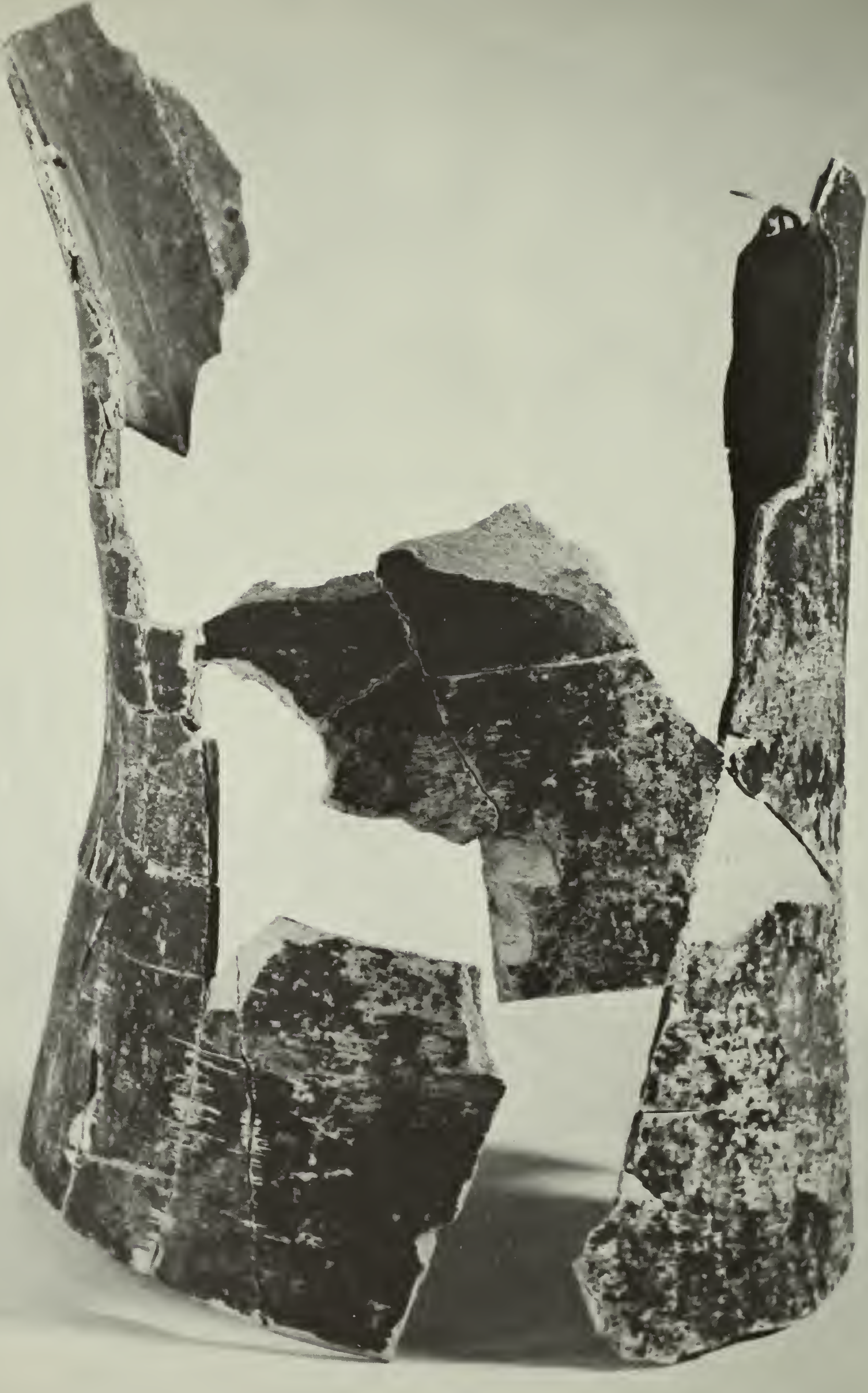


283 Yucca-strip ties. Elongate loop at lower right, right-angle loop at lower left.

284 Yucca strips used in mesh, chains, and braids.



285 Narrow-leafed yucca plant, lacking the root, from Room 33.



CHAPTER 11

miscellaneous objects

It is not possible to place every article recovered from Mug House in one of the functional categories discussed in preceding pages. Many of the items described below can be given functional interpretations, but the functions attributed to them are difficult to pin down. For example, a figurine may be a sacred image, a toy, or mere decorative device. One needs to see such an object in use in order to tell. What characterizes a charm or amulet other than the fact it is thought to possess some supernatural efficacy? When does a toy cease to be a toy and become a tool?

PROBABLE CEREMONIAL PARAPHERNALIA

The identification of ceremonial paraphernalia requires more than observation of form and appearance. The absence of a recognizable physical function is virtually a first requirement. The following objects are considered to have possibly belonged to the ceremonial equipment of the Muguenos because of where they were found, because similar objects are identified as having ceremonial significance among historic Pueblo Indians, and because no practical economic function can be proposed for them. They are not simply items whose use is indecipherable (these appear later in this chapter), and they may be assumed to represent only a small part of the total ceremonial paraphernalia.

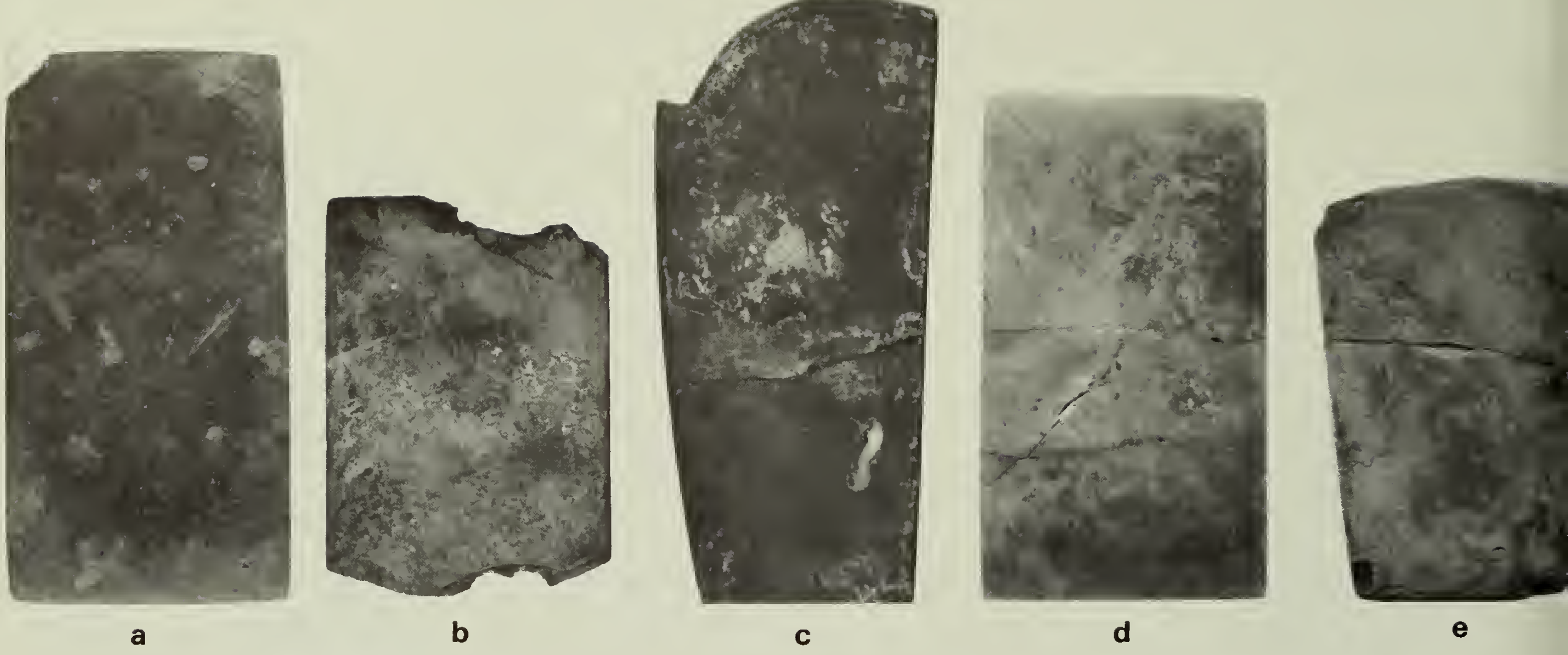
Stone Tablets. Some flat slabs of shale and sandstone were distinguished from ordinary worked sandstone slabs by extensive grinding on their faces and edges. These stones are called tablets for want of a better term, but they should not be confused in function with wooden tablets set in altars or worn during modern Pueblo ceremonies.

The best and most complete specimen was found on the floor of Kiva D, near the wall opposite the ventilator opening. It is almost perfectly rectangular, 30.2 cm. long by 15.9 cm. wide, and has been carefully ground to a maximum thickness of 1.2 cm., tapering toward each edge and especially toward the four corners (fig. 286a). One of these corners has been broken off. The two slightly convex faces run essentially parallel to the bedding of the hard shale or incipient slate from which it was made. Both faces are quite smooth from polishing or handling, although a few scratches are visible. No signs of paint are now visible, but a heavy lime incrustation necessitated intensive cleaning. Interestingly enough, when this tablet is supported horizontally on the tips of the fingers and struck with a stone, stick, or bone, it produces a clear, bell-like sound.

A second smaller tablet of the same material and same manufacture has a biconical hole drilled in the center of one short side (fig. 286b). The opposite short side is convex. It came from the rubble fill in Kiva D, where it must have fallen from its original position on the floor of the courtyard above or in one of the now-collapsed rooms surrounding the courtyard. This tablet had been thinned to a maximum thickness of 1.3 cm., tapering toward the edges. In spite of considerable breakage, it gave off a high, clear sound when struck.

One well-ground tablet of the same shale was made in the form of a jog-toed, woven sandal, but it was decidedly larger than such sandals—30.9 cm. long by 13.3 cm. wide by 1.2 cm. thick (fig. 286c). We found it in the fallen roof debris in Kiva G. The stone is cracked and the laminae have separated somewhat. When it was tapped, it emitted only a dull thud.

Two tablets in the Mesa Verde Museum had been found in Mug House in 1935 and 1950 by J. A. Lancaster in the course of stabilization work. The larger one was made from a fine, gray-brown sandstone foreign to Mesa Verde. It measured 33.9 cm. long by 19.4 cm. wide (fig. 286d). It was ground to a thickness of only 0.9 cm. all over, and there was no taper toward the sides or corners. The piece was badly shattered and one face was heavily weathered and checked. It came from the refuse immediately north of Kiva A. The



286 Stone tablets.

second was smaller, had a trapezoidal shape, and was ground to an even thickness of 0.8 cm. (fig. 286e). Grinding did not conceal all of the original surface of the sandstone slab nor the scars of bifacial chipping around its edges. In spite of being broken into two pieces and then mended, it produced a good tone when struck. This tablet was found in Room 23.

We also found six other incomplete tablets or fragments of tablets. They all seem to have been roughly rectangular in shape. Four specimens of sandstone had thicknesses of 1.0, 1.7, 2.3, and 2.5 cm., and the two fragments of shale were 0.7 and 0.9 cm. thick. One of the shale pieces probably came from a fully ground tablet, but on the other five chipping scars were visible through the grinding on the edges, and the faces were only partly ground. One came from an interpilaster space in Kiva D, another from the fallen roof debris in Kiva E, a third from Room 45, a fourth from redeposited rubble in Kiva C, and one each from Levels IV and V of the trash slope, which places them in Components B and A, respectively.

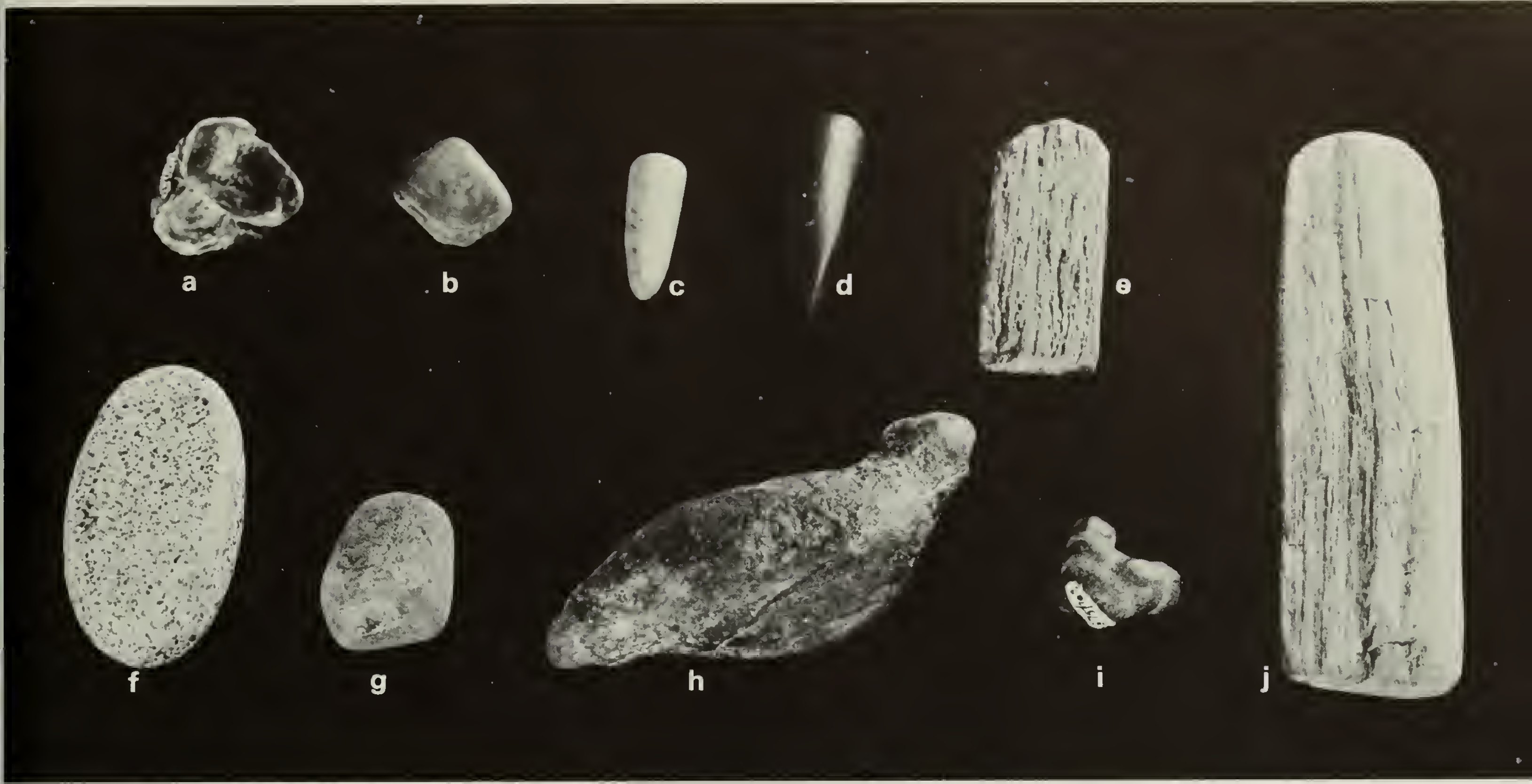
The proveniences of all 11 stone tablets suggest an association with kivas. Those not found in place in kivas once rested in courtyards above the kivas or in rooms immediately adjacent to them. There is certainly no strong correlation with domestic spaces. Thus far, no one has satisfactorily demonstrated the purposes served by stone tablets. Morris (1939, p. 132) favors a primarily utilitarian interpretation, calling them lapstones or lapboards. Kidder and Guernsey (1919, pp. 105–106) do not accept the notion that the sandal-shaped objects were actual lasts for sandal making and suggest that they might have been patterns to guide the sandal maker. Judd (1954, pp. 280–282, and 1959, pp. 141–142) is of the opinion that stone tablets had ceremonial rather than practical functions. Objects of phyllite from Pecos Pueblo (Kidder, 1932, p. 94) closely resemble the Mug House tablets. One of two oblong plates gave "a clear, tinkling note, not unlike that of a small metal bell," when suspended and tapped. Another was found with ceremonial material in one of the rooms at Pecos.

I believe that the stone tablets had some ceremonial function, and would suggest that they may have been manufactured, at least in part, for their bell-like sounds when struck. The only direct evidence known to me in support of this suggestion is the use of long, thin, basically unmodified bell stones among both protohistoric and historic Pueblo Indians along the Rio Grande in New Mexico (Lambert, 1954, p. 132).

Petrified Wood. Among the stone objects considered sacrosanct by Pueblo Indians are pieces of fossilized wood (Parsons, 1939, pp. 194 and 330). We found nine small tabular sections of petrified wood in Mug House (fig. 287e and j). They ranged in size from 3.7 by 1.2 by 0.7 cm. to 12.2 by 2.8 by 0.8 cm., and in weight from 4 to 42 gm. All were partly ground on faces, sides, and ends. Two were found with Burial M6, two in the rubble fill of Kiva H, two more in the rubbish filling the old grinding bins adjacent to Room 76, another in the trash dump a short distance below the bins, and one each in the rubble in Kiva F and Rooms 80–81. Except for the two with Burial M6, they are clearly associated with the southern portion of the dual division.

Stone Effigies. Four small, well-worked stones are designated as effigies because they seem to have been intended to represent some animal or object. In 1928, J. L. Nusbaum found an "animal" effigy in Kiva A. Two small, conically drilled depressions and a narrow triangular groove on one end of an oblong piece of red ferruginous siltstone appear to represent eyes and nose, respectively (fig. 288). A third drilled depression on the opposite end could be interpreted as a tail. The object measured 6.3 by 2.2 by 2.5 cm. It is the only object from Mug House that even remotely resembles the animal fetishes Cushing described from Zuñi (Cushing, 1883).

A similar form, but without any definite surface markings, came from the fill of Room 42. The effigy was made from a nearly black chert (?) pebble, 3.4 by 2.3 by 1.9 cm., by grinding all surfaces and edges smooth. We might have classified this specimen as a polishing stone



287 Probable ceremonial objects. a–b, Fossil molluscs; c–d, stone cones; e, j, petrified wood tablets; f–g, stone effigies; and h–i, sandstone concretions. Length of j, 12.2 cm.

288 Animal (?) effigy.

except that grinding on every surface is never seen on polishing pebbles.

A long ovoid pebble of coarse-grained igneous rock had also been ground over all surfaces (fig. 287f). One face was ground flat to slightly concave, as if the stone were designed to lie against some other object. This pebble closely resembles some of the Basketmaker spear-thrower weights from northeastern Arizona (Kidder and Guernsey, 1919, pp. 180–181), although I do not mean to imply that it was once used as such. It was found in the upper part of the trash slope, and measures 5.6 by 2.7 by 2.1 cm.

The fourth stone approximates the segment of a cone in shape (fig. 287g), as if it were intended to represent the large half-oval sandstone objects that Fewkes identified with the Hopi god of germination (Fewkes, 1920, p. 63). It was made from a small, fire-reddened sandstone concretion by grinding all surfaces, and measures 2.8 by 2.1 by 2.0 cm. We found it in the backdirt tossed out of Rooms 45 and 46 by diggers of the past century.

Stone Cones. Two small cones (fig. 287c–d) are virtually identical to a fetish from Zuñi said "to represent the relic of the weapon or tooth of a god" (Cushing, 1883, p. 45). Both are polished all over except for the flat base, which appears only to have been ground. The larger one, measuring 4.4 by 1.3 cm. and made of black chert or claystone, was found on the floor of Room 62. The other, of green hornfels, measures 2.9 by 1.0 cm. It came from the floor of Room 77.

Concretions. The sandstone cliff in which Mug House was built abounds in concretions, so it was often difficult to know for certain whether the concretions found in the ruin were the result of erosion or whether they had been collected by the Indians. Therefore, we saved only those that showed evidence of working, that appeared to be foreign to the local sandstone outcrops, or that came from places where man alone could have put them.

Large concretions were favored for pot supports in the hearths, and two of these were probably intended for this use, although they had not yet been set in a fire. They were only slightly pecked. One came from the floor of Room 24 and the other from the trash fill in the grinding bins next to Room 76. Concretions were also used for saws and abraders. Two concretions from the trash slope show evidence of probable grinding on their flat faces.

On the floor of Kiva C, against the side of the deflector facing the ventilator opening, we found about one-quarter of a small shallow bowl made from part of a hollow concretion. The exterior had been extensively ground to a flat bottom, but only part of the interior surface was smoothed. Another bowl-shaped concretion from the refuse dump was apparently unworked, and still another fire-reddened one had an oval hollow gouged out of one flat surface. The last may have been a source of bright red sand.

Twenty-five other sandstone concretions, many unmodified or broken, came from the trash slope or the rubble accumulations in the ruin. Several contained a high proportion of iron. Shapes were irregular, conical, oblong, spheroidal, discoidal, egg-shaped, elongate, and cylindrical. Two small cylindrical concretions were found in the ventilator of Kiva G.

We also encountered three hematite concretions or nodules. Two unmodified ones of irregular shape came from Room 62 (fig. 287i) and Room 80. The third, from Area I, suggests a bird (fig. 287h).

Waterworn Pebbles. Waterworn pebbles and cobbles were brought into Mug House as raw material for many kinds of tools, but 27 whole or broken pebbles showed no signs of working. Nineteen of these, weighing less than 90 gm. each, are too small to have been made into tools. The other eight range from 120 to 1,193 gm., and came from refuse and rubble deposits with one exception: two pieces of one pebble came from Area I and Room 7. The largest was in Component A trash beneath Room 62. Five of them are quartzites, two are sandstone, and one is porphyry.

Eight other smaller pebbles—four quartzite, two chert, one porphyry, and one quartz—were found on the trash slope or in the rubble filling Kivas E and F. One quartzite pebble lay on the floor of Kiva E. A nodule of pyrite, weighing 9 gm., came from the fill of Room 23.

Ten pebbles were among the contents of a pottery bowl found with Burial M6. They ranged in weight from just under 1 gm. to a little over 8 gm. Three were quartzite, two quartz, two chert, and one each of azurite, travertine, and iron pyrite or copper. They may have had some special value for their owner.

Fossils. Two well-preserved fossils recovered during our excavations were kindly identified by Dr. Halsey W. Miller, Jr., of the Geology Department, University of Arizona. One of these, from Room 12 (fig. 287b), is a brachiopod of the genus *Composita*, which are abundant in upper Paleozoic rocks west of the Four Corners. The other fossil, from refuse at the west side of Courtyard F (fig. 287a), is a pelecypod, *Gyrphaea newberryi* (Stanton), probably from the lower part of the Mancos shale, within easy range of the people living in Mug House.

We have no way of knowing to what extent these various items were valued or how they were used by their owners seven centuries ago. We do know, however, that the modern Pueblo Indians (within the last century) consider certain waterworn pebbles, concretions, pieces of petrified wood, fossils, and lumps or crystals of attractive minerals to be sacrosanct: that is, they possess supernatural power (Parsons, 1939, pp. 194, 329–333; Cushing, 1883, p. 45). For want of any better explanation, the modern usage may be projected backward in time to the prehistoric objects, although we should recognize that some or all of them may really have had some other purpose. The waterworn pebbles and slivers of petrified wood found with Burial M6 tend to substantiate our projection.

289 Reed cigarettes.

Reed Cigarettes. From the frequent use of reed cigarettes in modern Pueblo Indian ritual (Parsons, 1939, pp. 297–298; Stevenson, 1904), we might expect that similar objects found in prehistoric sites would have similar functions. The 11 cigarettes we recovered were made by cutting a section of reed (*Phragmites*) on either side of a node, then piercing the nodal membrane so air could pass through. As the tobacco (?) burned, the reed tube was consumed also. Ten of the Mug House specimens had been completely burned out and were reduced to

290 Feather quill inserted in corncob. Divider points are 1 inch apart.

lengths of 3 to 5 cm. (fig. 289). The other one, measuring 8 cm. in length, still held a dottle.

The reed cigarettes were found in the dry refuse and rubble filling several rooms and kivas in the lower cave. All smoking in Mug House was apparently done with these cigarettes alone, since we found no pipes or pipe fragments in the ruin. Wild tobacco of several species grows in the Mesa Verde area today, but we have no way of knowing if these plants were smoked by the prehistoric Indians.

Corncob With Feather Quill. A short corncob has a large wing-feather quill inserted in one mud-packed end; the other end is broken off (fig. 290). The protruding end of the quill has been chewed by rodents. The specimen is 6.5 cm. long. It was found in the deepest level of debris in Area VI. Another corncob, from the backdirt overlying Kiva E, has been punctured at one end. The hole in this specimen may once have held a feather quill.

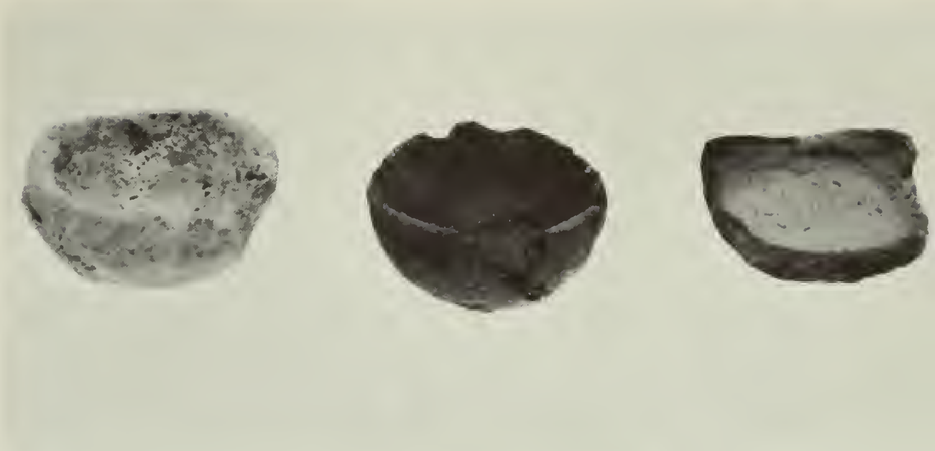
291 *Bundle of sagebush twigs held by a yucca strip. Divider points are 1 inch apart.*

Ears of corn are important in modern Pueblo ritual (Parsons, 1939, pp. 319–323). They are frequently built into prayer offerings and fetishes.

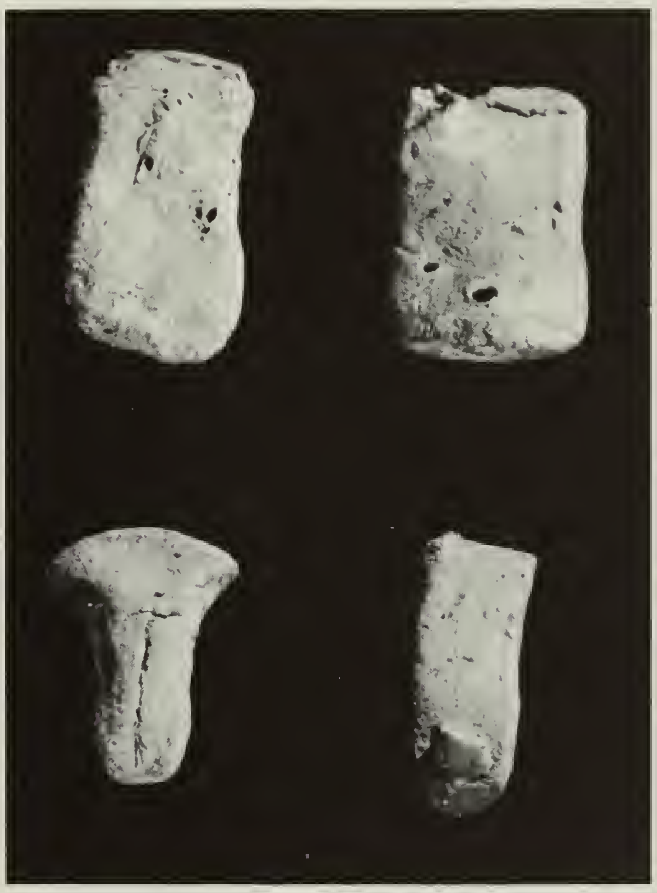
Twig Bundle. A bundle of about 10 small, leafless twigs of sagebrush, wrapped with a split yucca strip 0.1 cm. wide, was found on the surface. It measures 3.7 cm. long and 1.5 cm. in diameter (fig. 291). Since sagebrush is used as a remedy by certain modern Pueblo Indians (Robbins, Harrington, and Friere-Marreco, 1916, pp. 44–45; Whiting, 1950, p. 94), the Mug House bundle may have played a part in curing ceremonies.

PROBABLE TOYS AND GAMING OBJECTS

Miniature Clay Bowls. Three bowls, each less than 3 cm. in diameter, could hardly have had any practical use (fig. 292). They were apparently lump modeled with clay containing crushed sherd temper (two whole specimens) and fine sand (one fragmentary specimen). They were not fired, but the fragment may have been slightly baked in the ashes of the hearth in Room 24/1, where it was found. The complete miniatures accompanied Burial M11, an infant less than 1 year old, and Burial 37,

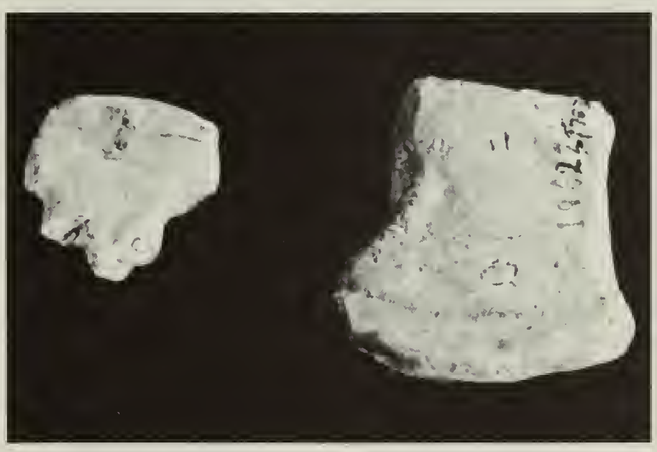


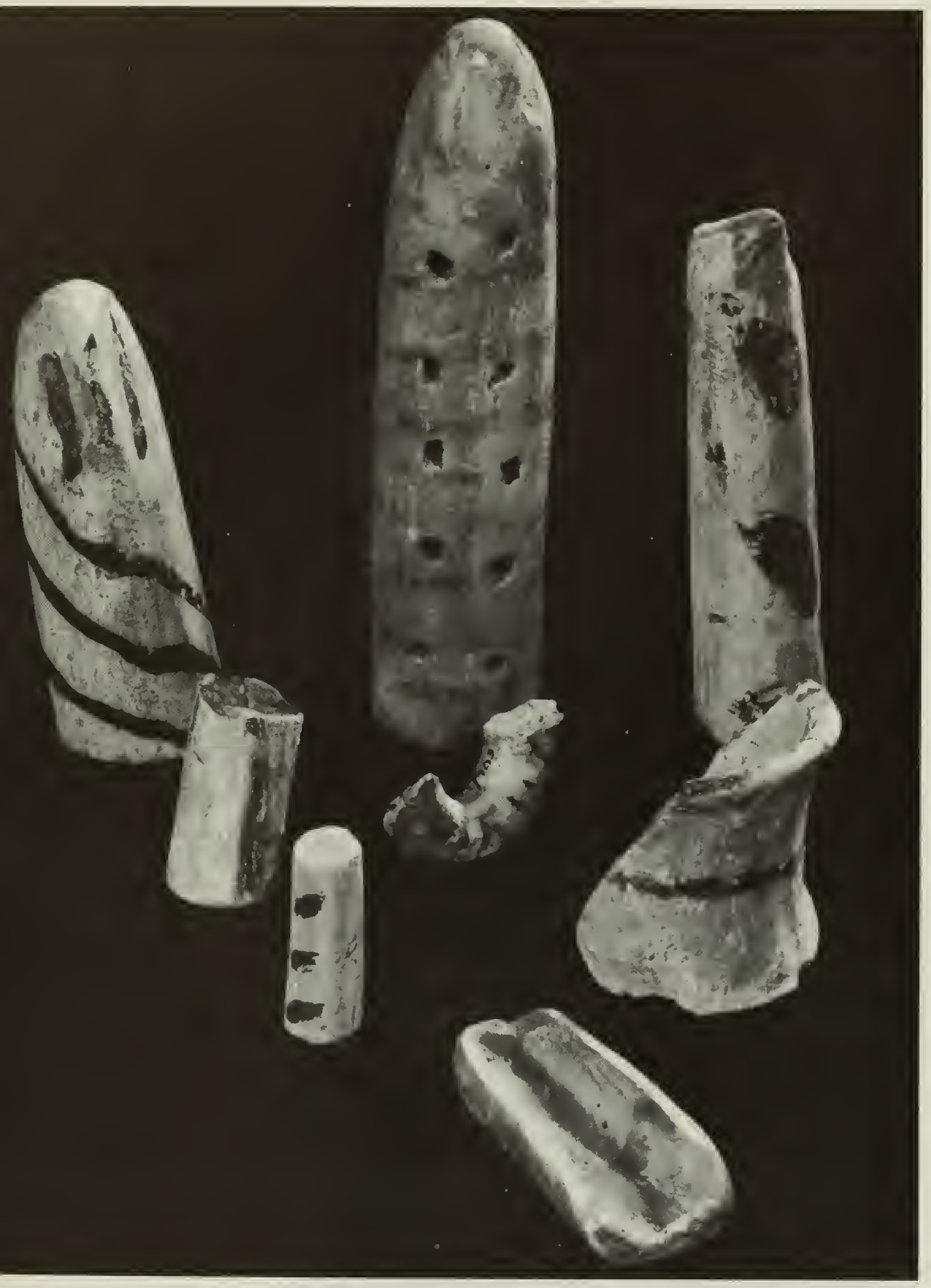
292 *Miniature clay bowls.*



294 *Clay figurines from Mug House representing a possible human head or face, left, and body, right.*

293 *Clay figurines from Adobe Cave.*





295 Sherds reworked into unusual shapes.

a child between 5 and 6 years of age.

Clay Figurines. Six small, complete or fragmentary figurines of unfired clay bear faint markings suggesting human representations. Four were found on the floor of Room 4 in Adobe Cave and belong to Component B. The other two came from the trash slope in front of Room 60 and from Kiva A in Mug House.

The four Adobe Cave specimens (fig. 293) are roughly comparable to Basketmaker III figurines from the San Juan drainage (Morss, 1954, fig. 19). The largest measures 4.7 by 2.0 by 0.7 cm., and has a slightly raised ridge (nose?) running lengthwise near one end and one very shallow scratch (eye?) at right angles to it. There are also faint protuberances near the center of the two long sides.

The head fragment from the Mug House trash slope (fig. 294, left) has two straight scratches for eyes with a scar between them where a raised ridge, or nose, has broken off. It is 1.7 cm. in height, 2.2 cm. in width, and only 0.5 cm. in maximum thickness. The Kiva A specimen bears no distinctive features other than its shape (fig. 294, right). Both Mug House figurines have been slightly fired, possibly by accident.

Figurines of post-Basketmaker III manufacture are virtually nonexistent from the Four Corners country except for the so-called babes-in-cradles (Morss, 1954, p. 38). Several of our figurines do resemble some of the detached "babes," but we found no empty "cradles," either loose or as parts of dipper handles. Probably all six were made and used separately. I am inclined to consider them toys until we have concrete evidence of other use. It is possible that the four Adobe Cave figurines were really made in Basketmaker III, but they were found in an early Pueblo III context and no older archeological remains have been discovered in Adobe Cave.

Small Sherd Disks. Four very small disks, ground from potsherds, were collected from beneath the floor of Room 60. Two were made from decorated sherds of McElmo-Mesa Verde Black-on-white and two from undecorated sherds of painted vessels. They range in diameter from 1.4 to 1.9 cm. and may have been counters.

Sherds Reworked Into Unusual Shapes. Seven broken handles from dippers and small jars and part of the neck of a small jar have been reworked into a number of interesting shapes (fig. 295).

Three round dipper handles, two of them hollow and one solid, have been ground on their broken ends so they will stand up on that end. Another small, troughed dipper handle was ground on all edges, making a sort of scoop. This specimen came from Component B rubbish, the other three belong to Component C deposits.

Two thin, round, solid handle fragments were made into small cylinders by grinding one or both broken ends. Both can stand up. A small loop handle has a ground facet on its convex side. Standing on that facet, the object simulates a broad, shallow U.

The remaining specimen in the group represents about one-half of a small jar neck, ground on the basal broken edge so it, too, stands up.

One of the hollow dipper handles was found on the floor of Kiva G, and one of the small cylinders came from the floor of Room 63. All others were found in the trash slope. The seven decorated sherds could be classified as McElmo-Mesa Verde Black-on-white.

OBJECTS OF UNKNOWN PURPOSE

Anyone analyzing the remains of prehistoric human populations expects a residue of items that do not fit any category and for which he cannot ascribe a function. Those items exhibiting a distinctive form, or which required considerable effort in their manufacture, should be separately described. What items still remain have questionable value because they are too fragmentary, because they show very little working, or because their attributes seem contradictory. Most objects discussed below have been given some label to facilitate reference to them. Very fragmentary items, and those on which intentional shaping may be questioned, have been discarded. Still unassignable specimens are called indeterminate.

Tchamahias. Concerning these objects, Parsons (1939, p. 194) observed, "Ancient stone hoes called chamahia by the Hopi are Altar fetishes (Hopi, Acoma). They represent the Stone people (Hopi), 'people of the stone when it had speech and life,' living in the four corners of the earth." Did these stone objects have ceremonial significance in ancient times, or were they utilitarian tools then? Prehistoric stone axes, made originally for the purely practical task of cutting wood, have assumed supernatural value among the historic Pueblo Indians, who now use the steel ax. Chipped stone projectile points have undergone a similar shift in emphasis, although at least some of the ancient ones had magical powers (for example, the four points found in the "medicine kit" with Burial M6). Because of this unanswered question and because writers have disagreed on the possible function of tchamahias, they are grouped here with objects of unknown purpose.

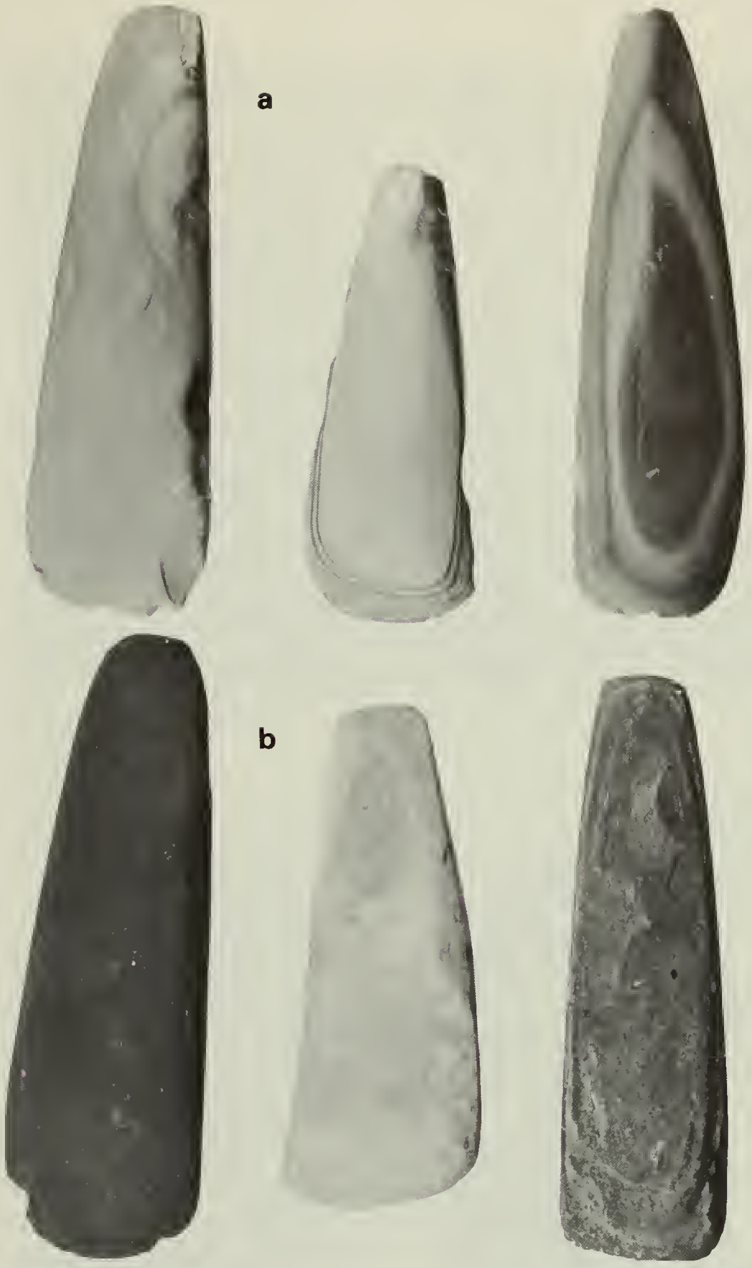
The seven whole and seven broken tchamahias from Mug House were all made from hornfels of various colors: nine, gray to black; two, mainly red or pink; and three, light gray or tan with thin, black bands.

Rough shaping was done by chipping. The specimens were then finished by thorough grinding over the entire surface, almost completely obliterating all signs of chipping. Each one acquired a fine polish on at least part of its surface, presumably through use. Probably use also accounts for some of the nicks in the broad bit. Four of them have traces of a red stain, possibly paint, near the bit.

Nine specimens were subtriangular, with a short side ground to a sharp edge and the two longer sides tapering toward a narrow, rounded butt (fig. 296). The sharp edge was convex and often slightly asymmetrical. Two specimens had rechipped handles (fig. 297e). One other had apparently been side notched (fig. 297b). Another specimen, roughly triangular and made of hornstone, had been collected from a kiva in Mug House by Nordenskiöld (1893, pl. XXXVI, 9).

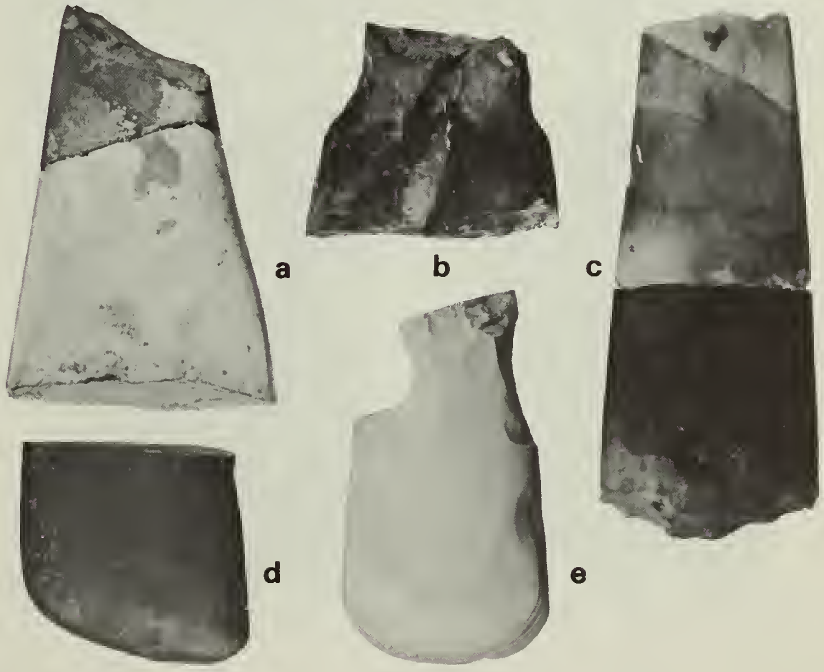
The tchamahias were found in refuse and rubble accumulations throughout the lower cave, and in equal numbers in the north and south sections of the trash slope. A bit fragment (fig. 297d) lay on the floor of Kiva G, just inside the ventilator opening. A complete specimen came from Room 77. None seemed to be resting in positions where the people had placed them.

Tchamahias are frequently called hoes because of their striated and polished surfaces and their battered edges (Morris, 1939, p. 139; Judd, 1954, p. 245; Woodbury, 1954, pp. 166–167). Actually, the brittle hornfels would probably be one of the last materials selected for heavy-duty agricultural work even if it had been readily obtainable. According to Morris (1939, p. 139), the gray and black hornfels or hornstone may have been quarried "a few miles west of the La Plata Valley, between the San Juan and the south rim of the Mesa Verde plateau," and the banded and multicolored varieties are known to



296 Tchamahias.

297 Tchamahia fragments. Two specimens, b and e, were rechipped.

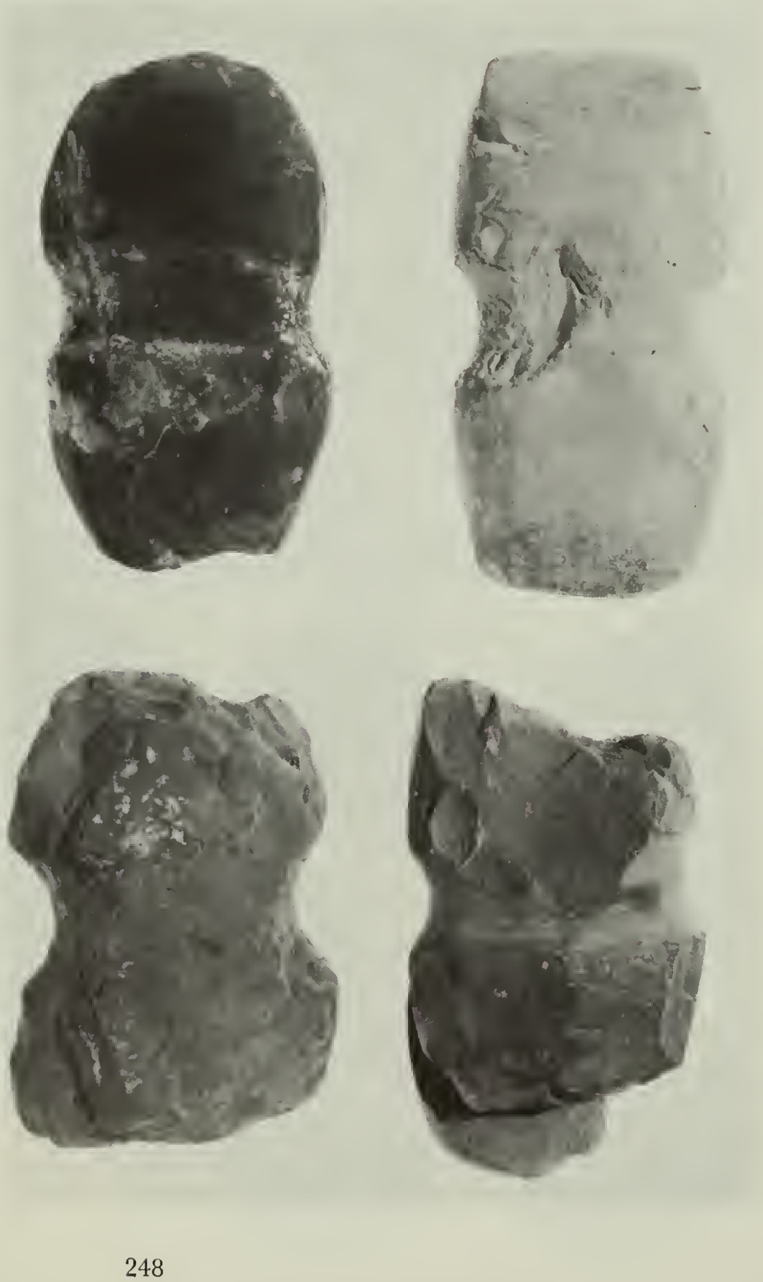


outcrop only in Arizona, just south of the San Juan River.

Several writers have offered extensive discussions of tchamahias, generally arriving at the conclusion that they were some kind of hafted agricultural tool. They all ultimately cite Morris who states that "the condition of the margins of the blades and of the chipped places which they had acquired in service proves conclusively that they were used in the earth" (ibid.). Morris based his *proof* on the presence near the edges of "worn grooves and minute striations produced by the scratching of sand grains, extending longitudinally of the implement" and the fact that "the concave surfaces of the chipped places eventually became thoroughly polished."

Careful examination of the edges of these objects revealed minute striations, some of them running longitudinally, others at right angles to them, and still others at various oblique angles. The whole pattern of overlapping zones of striations running in many different directions would most likely come about through grinding to shape, perhaps on sandstone, so that individual sand grains would actually be responsible for the marks. Some of the chip scars are thoroughly polished, and some are not. Constant use in the ground would polish all chip scars, even the most recent ones, unless the tools were discarded immediately after chipping.

298 "Club heads."



While accepting the role of a hoe for tchamahias, Woodbury refers to "the impression that the better polished and more fragile tcamahias are unsuitable for digging or hoeing," but he fails to explain this unsuitability or to counter it (Woodbury, 1954, pp. 166–167). Judd, too, calls them stone hoes unquestioningly, remarking, "Since agriculture was the principal industry at Pueblo Bonito, the insignificant number of stone hoes unearthed there is astonishing" (Judd, 1954, p. 245). He does suggest that wooden digging sticks may have been the predominant farming tool.

A specimen collected in 1879 from Zuñi was called a skinning knife, without quotation marks (Stevenson, 1883, p. 342, fig. 355). Since then, the term "skinning knives," with quotation marks, has been used by many writers, including Morris. Tchamahias are most abundant in the northern San Juan country during late Pueblo II and Pueblo III, although specimens were recovered from Awatovi in Pueblo III through V contexts (Morris, 1939; Brew, 1946; Woodbury, 1954). That many of them, if not all, were hafted, probably in the manner described by Morris, is evidenced by the marks of wrappings and the stain of decayed wood on the slender ends of several pieces (Morris, op. cit.). The form may also appear in horn. At least four tchamahias from Mug House bear possible red paint stains. We are told that objects of this sort are used on altars by the Hopi, who place a high ceremonial value on them (Fewkes, 1909; Parsons, 1939).

It is possible that tchamahias never had purely utilitarian purposes.

"Club Heads." Superficially, 11 grooved and notched stone heads in our collection resemble double-bitted axes (fig. 298). But each one has some feature that disqualifies it as a wood-chopping tool: either the material from which they are made is too brittle to withstand blows against wood, or the bits have been intentionally blunted by grinding or battering.

The brittle raw materials include chert (4 specimens), the black slatey hornfels used also for some tchamahias and tablets (2), and a soft, fine-grained igneous rock (1). Quartzitic sandstone and coarse-grained igneous rocks (2 specimens of each) are strong enough for chopping, but all four specimens have blunted edges. Red and yellow paint stains occur on six specimens.

These objects were shaped in the same manner as axes: by chipping, pecking, and grinding, in sequence. Two have been chipped only, and a third was slightly pecked on one face after chipping. Pecked and ground grooves encircled the center of five specimens. Pairs of similarly located side notches, formed by chipping and finished by pecking, provided attachments for hafting on the other six. That they were hafted is indicated by the presence of strap marks on both faces of one specimen found at the north end of Courtyard G, and is demonstrated by the specimen obtained from one of the kivas (A, B, or C) by

Nordenskiöld (1893, pl. XXXVI, 4).

Nordenskiöld's hafted specimen has a full groove in the middle and is made of a "hard amygdaloidal rock." The handle, 18 cm. long, is "composed of twigs bent round the axe and bound with strips of yucca [yucca cordage] and hide." It is "adorned on 1 side with parallel lines [incised] in 2 directions." Red and yellow pigment is visible on 6 of the other 11 specimens. We do not know if the rest were painted also; they had been washed before the stains were noticed.

Individual "club heads" were found on the floors of Rooms 9, 24, 28, 62, the second story of the north tower (Room 60/2), Courtyards G and H, and Kiva E. Another was found beneath the south tower (Room 76), and the remaining two came from the trash slope.

The proveniences give no clues to the function of the "club heads." Most of the specimens show scars and battering from some kind of use. In one specimen, both bits have been rechipped and then battered. A flake from this specimen includes an earlier ground bit with the sharpness of the edge removed by grinding. Apparently, this flake had been accidentally struck off when the artifact hit some hard object, presumably as part of its use, and the bits were subsequently rechipped to a new shape. The term "club head" implies use as a weapon. This is not incompatible with the appearance of the artifacts, although we have no evidence to indicate such use. The presence of paint stains and incised decoration suggests some ritual usage. A great deal of the so-called warfare among American Indians is ritualistic.

Notched and Grooved Stones. Six stones, most of them worked to shape, had opposed notches or full grooves chipped and pecked around them. Four had centrally located grooves or notches, and would make just as efficient "club heads" as the preceding group of artifacts. An unmodified segment of fossilized wood, fully girdled by a pecked groove, came from Room 58, a storeroom that contained many other stone and pottery items as well. Two notched cobbles were only slightly shaped on the ends and sides. The fourth was made by notching a mano fragment (style VSU2). The last three were found in the trash slope; one of the two cobbles was in Component B refuse. Weights of all four fall between 228 and 384 gm.

The fifth specimen, a large sandstone slab, weighing 3,884 gm. (8½ lbs.), was notched near one end. It was found in the rubble filling Kiva C. The sixth specimen is an oblong cobble, fully grooved near one end and crudely chipped at the other, weighing 777 gm. It was found in the upper fill of Room 71 and may have fallen from the roof above.

The notches and grooves suggest hafting or at least a place to attach a string. Possibly some or all of them were used as loom weights or tethers.

"*Crushers.*" Thirteen stone artifacts resemble manos in general outline and in the presence of a grinding surface. However, they exceed manos in thickness (4.4 to 9 cm.) and in weight (2,800 to 5,360 gm., or 6 lbs. 3 oz. to 11 lbs. 13 oz.). They were made from sandstone or conglomerate. Each has one essentially flat grinding surface that shows striations from reciprocal grinding. Four have pecked finger-grips.

299 "*Specialized rubbing stone.*"

These objects seem definitely intended for grinding. Their relative massiveness may have helped in crushing hard substances such as rocks and potsherds to be used as pottery temper. All the specimens came from deposits of refuse and rubble belonging to the latest component.

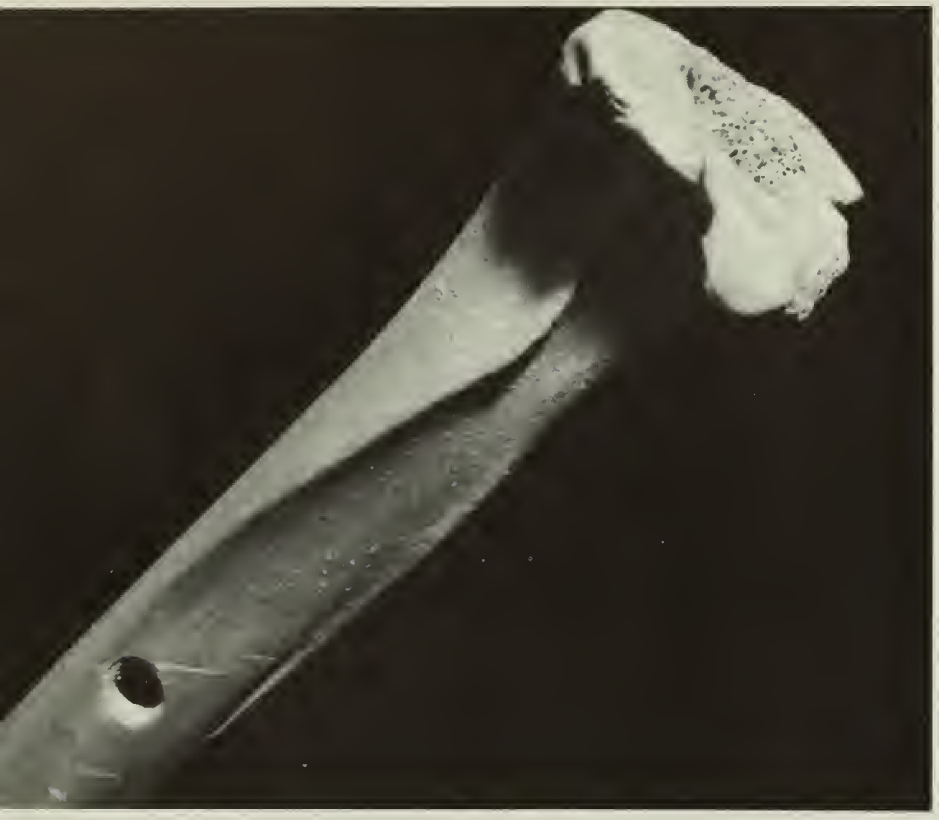
"*Specialized Rubbing Stones.*" The two broad, flat faces of these artifacts are well polished—possibly, but not necessarily, from use. The sides of each are evenly pecked to a rounded profile and the corners are rounded. Overall shape approximates an elongated oval. Each is made of a different material: sandstone, olivine basalt, and a coarse-grained igneous rock. The last, measuring 19.7 by 9.4 by 4.1 cm., is the finest specimen (fig. 299). It was found in Room 77. The other two came from the trash slope and the surface of the lower ruin north of Kivas A and B.

Incised Stone. A quadrilateral piece of sandstone bears two incised figures resembling bird tracks on one flat, pecked and ground surface. It was found on the surface of the lower cave north of Kiva B.

Indeterminate Stone Objects. The remaining stone objects have been divided into two size classes. Fifteen small objects may either be small tablets, or, more likely, incipient ornaments. The materials include red shale (5), black or dark gray shale (4), sandstone (3), travertine (2), and jet (1). These objects were all found in refuse and rubble in the lower cave. One sandstone piece came from Component A trash, one black shale piece came from Component B trash, and one piece of red shale was found with Burial M6.

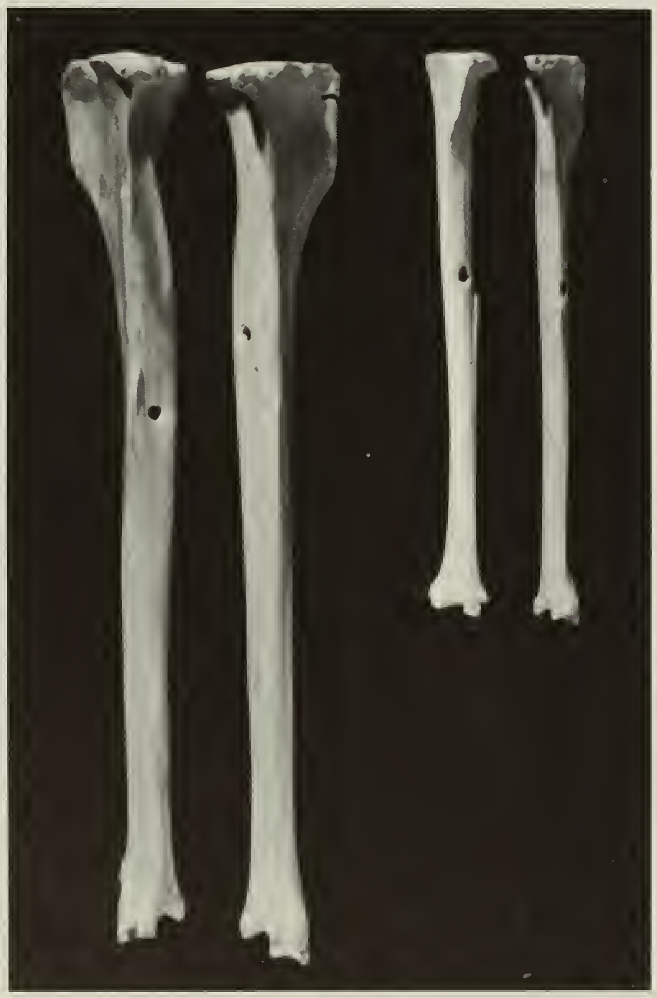
Fifteen larger objects of sandstone, conglomerate, quartzite, and coarse-grained igneous rocks show varying amounts of shaping.

Perforated Mammal Tibias. These objects were made by grinding off the proximal articular joint and then coring out the cancellous tissue down to the hollow part of the



300 Small mammal tibia with ground and cored proximal end and perforated shaft.

301 Perforated tibias of jackrabbit, pair at left, and cottontail, pair at right. All elements are from different animals.



shaft. Fifteen of the 18 specimens had a small second hole drilled in the shaft near the proximal end (fig. 300). Two clearly lacked this feature. The shafts are polished from use, but the distal ends show no modification.

The elements were identified as cottontail (10) and black-tailed jackrabbit (8). Right elements of the former outnumber lefts 6 to 4, while the latter are equally divided between rights and lefts. Only two possible pairs are present (fig. 301). The fill of Kiva H produced one right and one left jackrabbit tibia, but not from the same individual. A right and a left cottontail tibia were found close together in the refuse just outside the south end of the cave and could have come from the same animal.

The small hole in the shaft was placed on the dorsal surface in eight specimens, on the anterior-lateral surface in six cases, and on the anterior-central in one specimen. The three tibias without holes in the shaft were the right elements of cottontails. All the objects were found in refuse and rubble deposits in the lower cave and belong to Component C.

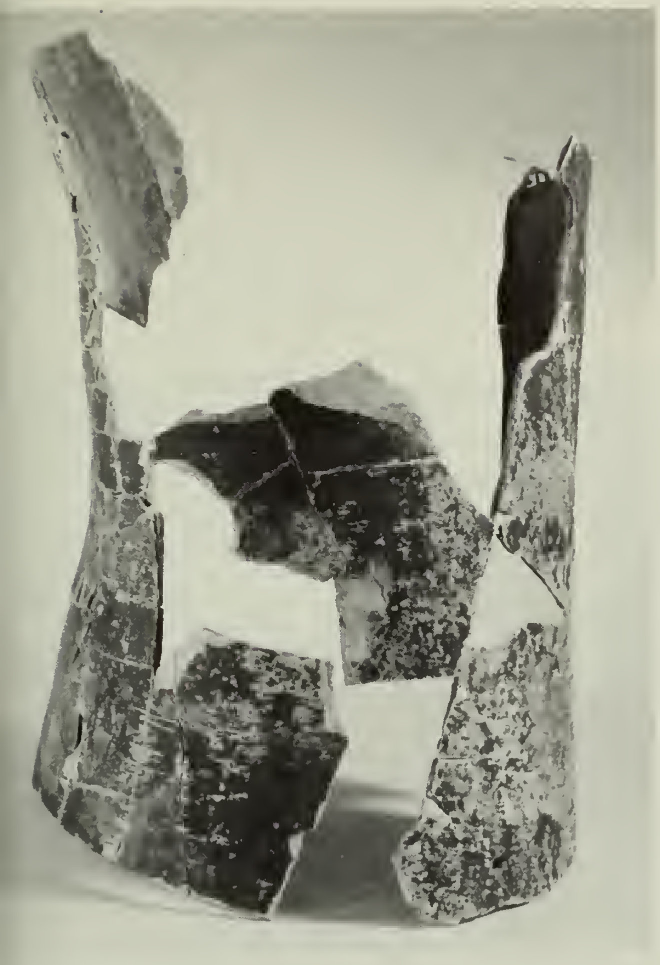
We obtained no clues as to what these objects were for. They have been called "tinklers" on the basis of one example in the Mesa Verde Museum with a fragment of yucca cordage running through the opening in the proximal end and fastened in a simple knot on the exterior of the shaft perforation (O'Bryan, 1950, p. 87). An old Sia man thought they might be whistles, but he was not able to show us how they work.

Miscellaneous and Problematical Bone Objects. Many of these specimens appear to be segments of long bones that may once have been parts of awls, but they cannot be grouped with the awls because they lack evidence of having had a point. Nine are turkey and eight are mammal, mostly artiodactyl. All the pieces came from rubbish or rubble in the lower cave except for one each from the floors of Rooms 66 and 31.

Three bone splinters, two turkey and one deer, have wear facets on one or more of their sharp sides, as if they might have been used as scrapers. Similar wear on one side of a center segment of bighorn sheep rib may be the result of similar use. The wear on these bone fragments is not unlike the dulling on edges of some stone flakes. However, it would be presumptuous to suggest that these few bits of slightly worked bone represent an artifact class. The deer bone splinter came from the slab cist on the banquette of the Component A kiva; the two turkey bone splinters came from Room 71 and the trash slope; and the bighorn rib fragment was from the rubble fill of Kiva C.

Two turkey radii and two turkey tibiotarsi had been modified only by having one of the joints of each cut off transversely. The shafts were slightly polished, possibly from handling. These bones may have been stock from which artifacts were to be made, or they may represent a stage in the manufacture of tubular beads. One came from the floor of Kiva H; the other three were in the general rubble and refuse.

Five other bone fragments show some work. These include a turkey tibiotarsus ground slightly on the articular joint and a split cannon bone cut to an asym-



302 *Aspen bark "cylinder."*

metrical point. The purposes of these specimens could not be determined.

Worked Sherds. Forty potsherds of irregular shapes have been ground on one edge, in each case. The evenness of the grinding, producing a square or rounded edge, sets off these sherds from the sherd scrapers with well-defined beveled edges. Pottery types represented are Mesa Verde Black-on-white (5), McElmo Black-on-white (6), indeterminate McElmo-Mesa Verde Black-on-white (4), Mancos Black-on-white (8), plain sherds from black-on-white vessels (16), and indeterminate corrugated (1). Most of them were found in the trash slope.

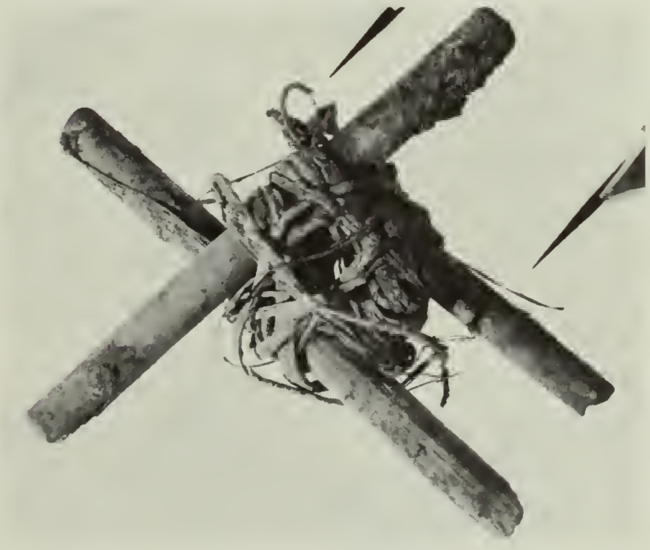
Twelve other sherds were ground on two or more sides to form rectangles, triangles, rhomboids, and ovals. Probably most of them would be called pendant "blanks" if we had found any drilled potsherd pendants. As it is, their purpose is unknown. Pottery-types represented are Mesa Verde Black-on-white (3), McElmo Black-on-white (1), Mancos Black-on-white (3), plain sherds from black-on-white vessels (4), and plain gray (1). We found most of these in the trash slope.

Aspen Bark "Cylinder." This artifact has provoked a wider range of opinions as to its function than any other object from Mug House. Viewed from above, it is not a true cylinder, but ellipsoidal, with the sides somewhat constricted near the middle (fig. 302). The object stands 3.1 cm. (12 inches) high, and the ellipsoidal opening measures about 18 by 29 cm. (7 by 11½ inches). It is made from a large slab of aspen bark. Several holes with willow-strip ties indicate either where additional bark slabs were fastened or where the object was attached to something else.

Fragments of this specimen were collected from the rubble fill of Room 44 and adjacent portions of Kiva E. Apparently it had rested in the second story of Room 44 until this structure collapsed.

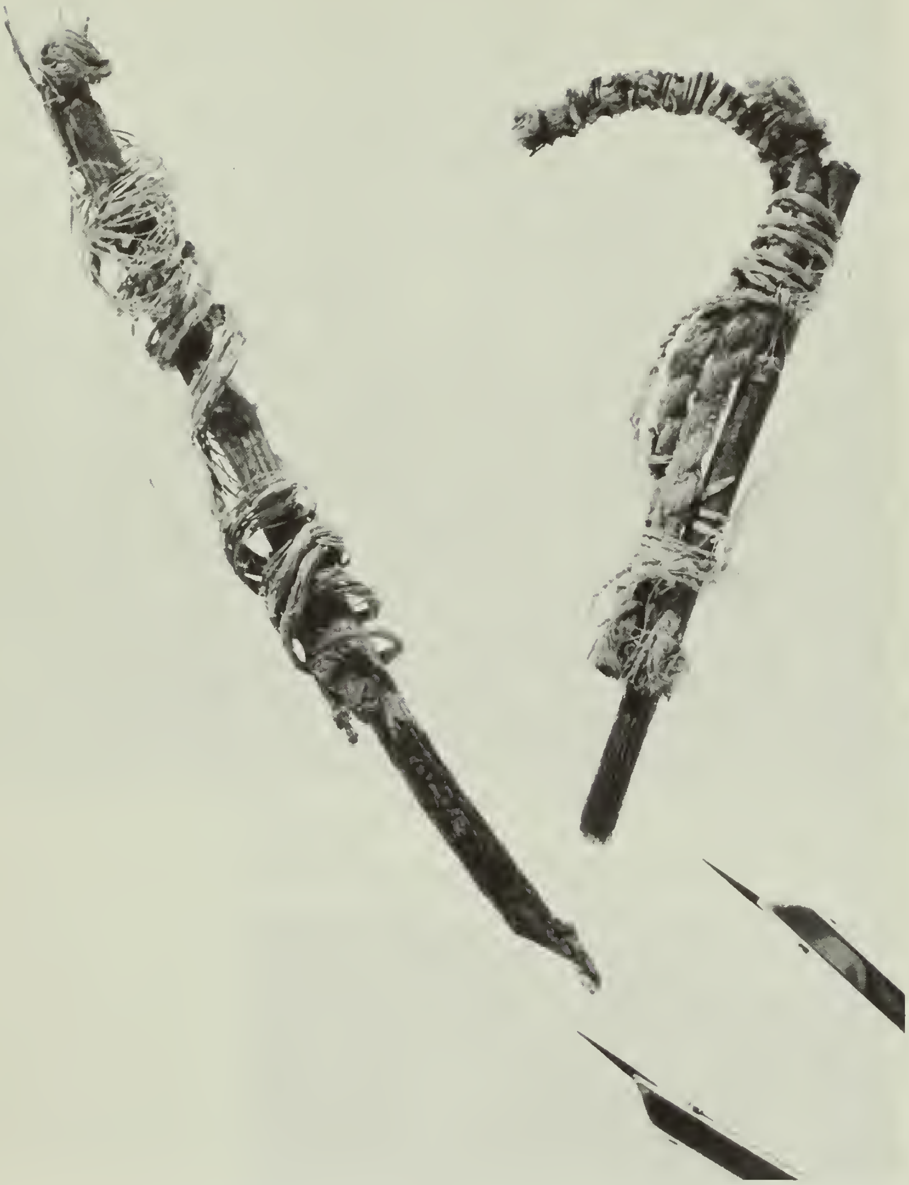
Suggested uses for this object include container, drum, brace for an injured or arthritic back, armor, cradle, and cradle hood. If it were a container, it would need some sort of bottom. If a drum, there must have been a skin stretched across one or both ends for striking, since the bark itself would soon grow too brittle to be struck. Is the small opening large enough to fit around a grown person's abdomen, either as a brace or as armor? A warrior could don the bark when green, but once dried it would be too brittle to put on and take off repeatedly. The size and shape argue against use as a cradle. Bark cradle hoods are known from northeastern Arizona (Guernsey, 1931, pp. 105–106, pl. 64) and the collections of Richard Wetherill from the Mesa Verde now in the University Museum in Philadelphia. These two hoods stand 20 and 27 cm. (8 and 10½ inches) high, respectively. No baby's neck could fit into the restricted side opening of the latter, however. While the last explanation seems most plausible, the actual purpose of the Mug House artifact is still problematical.

Ten other pieces of aspen bark were recovered from Rooms 55–56, 5, 7, 11, 29, and 42. Perhaps these once belonged to other "cylinders."



303 *Stick figure. Divider points are 1 inch apart.*

Stick Figure. In this object, five short sticks were bound together with narrow yucca strips so that they extended in three different directions. Only three sticks now remain (fig. 303). They are short lengths of mockorange, about 5.5 cm. long, peeled and finished at both ends. A fourth stick paralleled the one extending between the divider tips, and a fifth stood perpendicular, in the center of the other four. I would guess that the object had some ceremonial significance. It was found in the upper rubble fill of Kiva E, probably having fallen there from one of

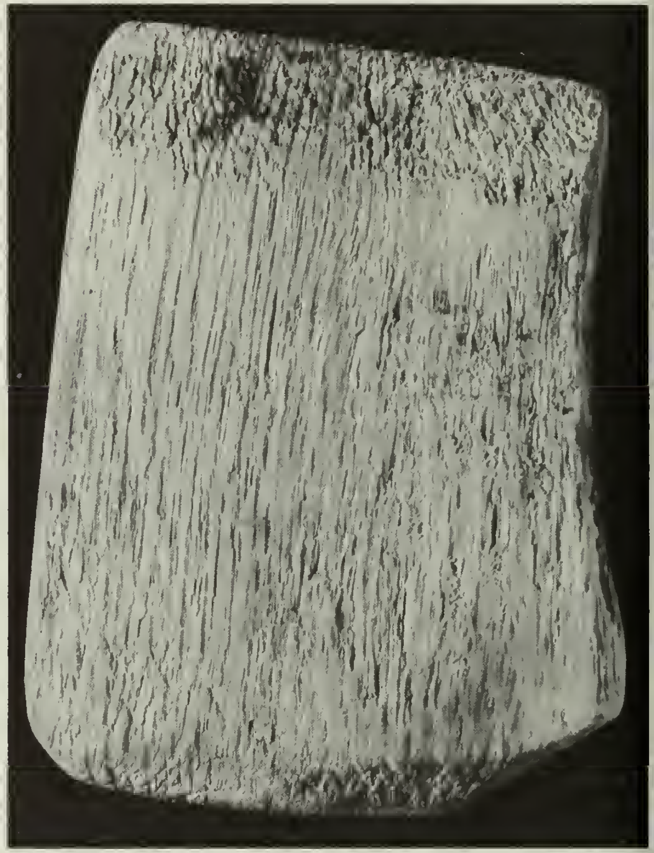


304 *Sticks wrapped with yucca strip and yucca twine. Divider points are 1 inch apart.*

305 *Cornhusk bundle. Divider points are 1 inch apart.*

the upper-story rooms above Rooms 44, 42, 45, and 46.

Sticks Wrapped With Yucca Strip or Twine. A yucca strip was loosely wrapped spirally around a short peeled stick of skunkbush broken at both ends (fig. 304, left). Apparently something had been attached to the stick, but it is now gone. A second stick of serviceberry with its bark has two lengths of feather-wrapped yucca twine (2-ply Z-twist) attached to it with two wrappings of very fine 2-ply Z-twist yucca twine (fig. 304, right). This object is also incomplete. It is tempting to think of these two objects as parts of prayer sticks. They were found in Rooms 46 and 55–56, respectively.



306 *Ground oak chip.*

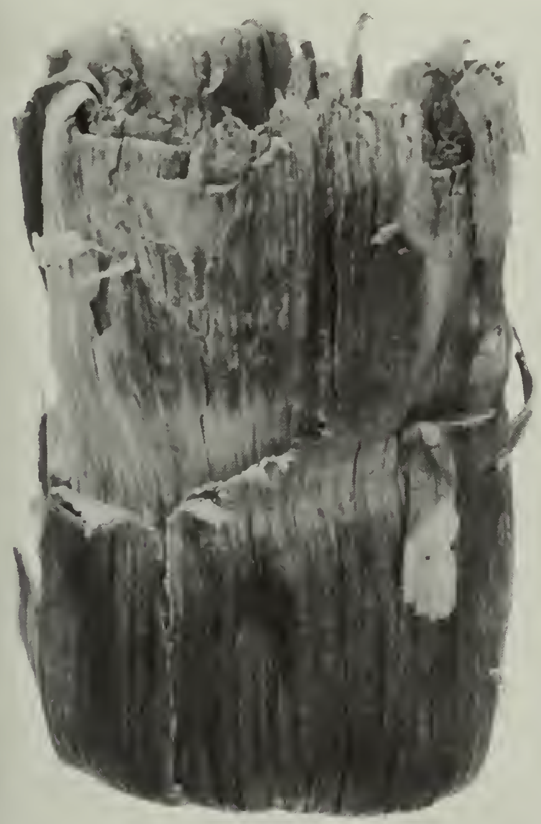
Cornhusk Bundle. A small bundle of split cornhusks had been wrapped near one end with a piece of loosely twisted husk and the end pulled under (fig. 305). The bundle was found in the old backdirt from the upper ledge that covered Kiva D. Its use is unknown.

Ground Wooden Chips. Two wooden chips have been ground into rectangular shapes, but not polished. The smaller one measures 5.3 by 1.6 by 0.5 cm., and is made of juniper. It would make a suitable game token or wooden die. The larger chip is of oak and measures 8.3 by 6.4 by 1.0 cm. (fig. 306). Both ends are partly beveled. Neither chip showed any signs of having been painted. The smaller one was found in the refuse in Area V, and the larger chip came from Room 44 fill. A third small juniper chip had one end ground to a sharp bitlike edge but was otherwise unmodified.

Miscellaneous Worked Wood. In the mass of perishable materials we found many sticks that showed signs of having been worked. There are 10 thin peeled rods with one end ground smooth and the other broken, ranging in length from 10 to 45 cm. Six are saltbush, two fendlerbush, and one each of greasewood and serviceberry. Five other thin rods, worked at one end and broken at the other, retain their bark. Three of these are willow and one each is fendlerbush and mountain-mahogany.

Three short rods have been ground square on both ends. Two of willow, 10 and 11 cm. long and 1 cm. in diameter, are unbarked. The other of mountain-mahogany has been peeled and measures 19 cm. long and 1 cm. in diameter.

307 *Folded cornhusk wad.*



Twenty-eight larger sticks have been peeled; they were cut or ground on one or both ends, or show use polish on their surfaces. There are eight serviceberry, six oak, six willow, three juniper, two chokecherry, and one each mountain-mahogany, mockorange, and saltbush. Two serviceberry and one juniper stick could have been intended for doorway lintels. Two oak rods are bent.

We found two split willow sticks which were tied together in a square knot.

Quids and Wads. During our excavations, 911 small masses of fibrous vegetal matter were recovered. The majority of these are wads of two varieties: the more numerous *crumpled* wads, which may represent waste material from some manufacturing process such as the preparation of yucca fibers for cordage; and the less common *folded* wads, which appear to have been prepared for chewing or squeezing (fig. 307).

About one-fifth of the total are quids showing toothmarks and, in some cases, the shape of the palate. Cornhusks and leaves were most often chewed, but corn stems—usually attached to leaves—and parts of yucca and amaranth plants were also used. Cornhusks are sweet and relatively tender; the stems are also sweet but somewhat coarser; the leaves are coarse-textured and hairy, and lack the sweet flavor of the other two. The tips of young amaranth stems are less desirable, and yucca is very coarse and not pleasing to the taste.

Some quids contained extraneous materials. One held the spine cluster of a cactus and at least three others had feathers in them. No traces of tobacco or *Datura* were found in any of the quids.

Today Pueblo Indians of New Mexico and Arizona follow practices that produce or would conceivably produce quids. They apply paint pigments to their bodies or to articles of costume in the form of a paste using plant juices, and they make a purple stain for decorative purposes "from the chewed stalks and husks of black corn" (Roediger, 1961, pp. 99–102). Also, in their ceremonies, a male chorus sings for hours, uninterruptedly or with only short breaks between chants. Under these circumstances, bits of plant material held in the mouth would keep the tongue and throat of a singer moist.

CHAPTER 12

interpretations

In this report I have endeavored to portray the life of the inhabitants of Mug House approximately 700 years ago. I have delved into aspects of their material culture and have tried to interpret elements of their socioeconomic structure. I have examined available information pertaining to Mugueno economy. The influence of environment was seen throughout to be important. In conclusion, I want to discuss the ways in which the Mug House people used the environment to satisfy their needs and desires.

RECONSTRUCTION OF THE 13TH-CENTURY ENVIRONMENT

Before we can study how the environment was used we must first know what it was. All clues we have been able to assemble indicate no change from the 13th-century Mug House environment to that of the present day. There is no evidence to suggest that erosion has produced any significant changes in the landscape. The remnants of ancient stone terrace walls in many of the drainage courses and on the talus slopes show that essentially the same ground surfaces exist today that the Indians walked over in the past. Smoke stains on the cave roof and slow-growing lichens on parts of the cliff face attest to the slowness of change in the outcropping sandstone. The smoke stains also indicate that several massive slabs of rock have fallen from the roof of the cave since the Indians left it and before the 1890 discovery.

The animal and plant remains we found in Mug House belong to groups living in the Mesa Verde district today. The 13th-century fauna included these present-day species: black-tailed jackrabbit, Nuttall's cottontail, desert cottontail, Gunnison's prairie dog, rock squirrel, southern pocket gopher, white-footed mice including the deer mouse, wood rats including the bushy-tailed wood rat, porcupine, bobcat, gray wolf, coyote, long-tailed weasel, badger, western spotted skunk, bighorn sheep, mule deer, and shrew.

Wild Plants. Stanley L. Welsh has identified, among nearly 4,000 plant specimens, the 44 separate species of wild plants listed below. All of these grow in the locality today with one exception. Miner's lettuce has not been collected recently. The figures in parentheses indicate both the worked and unworked specimens of a given taxonomic lot. Only the remains that could definitely be associated with the prehistoric Indian occupation of Mug House have been included. Taxonomic designations follow those employed in a plant checklist for Mesa Verde (Welsh and Erdman, 1964).

Trees:
- *Juniperus* sp.—juniper (482)
- *Pseudotsuga menziesii*—Douglas-fir (58)
- *Pinus* sp.—pines, general (18)
  - *Pinus edulis*—pinyon pine (61)
  - *Pinus ponderosa*—ponderosa pine (5)
- *Populus* sp.—poplars, general (3)
  - *Populus tremuloides*—aspen (13)

Woody shrubs:
- *Salix* sp.—willow (413)
- *Quercus gambelii*—Gambel oak (144)
- *Rhus trilobata*—skunkbush (27)
- *Amelanchier utahensis*—serviceberry (148)
- *Cercocarpus montanus*—mountain-mahogany (55)
- *Chrysothamnus nauseosus*—rabbitbrush (50)
- *Atriplex canescens*— fourwing saltbush (16)
- *Atriplex confertifolia*—shadscale (1)
- *Sarcobatus vermiculatus*—greasewood (13)
- *Sambucus coerulea*—blue elderberry (2)
- *Symphoricarpus oreophilus*—snowberry (3)
- *Prunus virginiana*—chokecherry (6)
- *Purshia tridentata*—bitterbrush (4)
- *Fendlera rupicola*—fendlerbush (9)
- *Philadelphus microphyllus*—mockorange (11)
- *Ribes leptanthum*—gooseberry (26)
- *Artemisia* sp.—sagebrush (58)

Grasses:
- *Phragmites communis*—common reed (331)
- *Oryzopsis hymenoides*—Indian ricegrass (70)
- *Poa fendleriana*—mutton grass (3)
- *Koelaria cristata*—junegrass (15)
- *Hordeum* sp.—barley (2)

Other:
Opuntia sp.—prickly pear (27)
Yucca sp.—yucca, general (864)
Yucca baccata—broad-leafed yucca (853)
Yucca harrimaniae—narrow-leafed yucca (5)
Allium textile—wild onion (2)
Cleome serrulata—beeplant (1)
Amaranthus sp.—pigweed (111)
Chenopodium sp.—goosefoot (7)
Helianthus sp.—sunflower (1)
Scirpus sp.—bulrush (4)
Typha latifolia—cattail (22)
Physalis sp.—ground cherry (16)
Montia (*perfoliata* ?)—miner's lettuce (5)
Astragalus sp.—milkvetch (1)
Carex sp.—sedge (1)
Polemonium foliosissimum—Jacob's ladder (1)
Clematis sp.— virgin's bower (2)
Eriogonum (?) sp.—buckwheat (2)

The relatively large quantities of juniper, yucca, reed, and willow, as well as the complete absence of such plants as Mormon tea (*Ephedra*), brickellbush (*Brickellia*), and hedgehog cactus (*Echinocereus*), probably indicate nothing more than the selectivity of man. Pollen of *Ephedra* was recovered from the trash dump, so we know it was growing in the vicinity. The Muguenos apparently did not collect this plant.

Perhaps the abundance of reed and willow, plus the presence of shrews, does indicate a minor difference in the environment of Mug House today and seven centuries ago. Somewhere in the rincon there may have been a permanent or near-permanent source of water around which weeds and willows grew and a small shrew population lived. It may be expecting too much to suspect that a spring or even a seep once flowed at the base of the cliff, although there is some water coming through the lower walls of Kiva G now, just above the layer of impervious shale that forms the bedrock floor of the cave. A short distance south of Mug House, however, the Muguenos did build a reservoir that might have held water often enough to encourage some of the more moisture-loving plants and animals.

The beeweed, pigweed, goosefoot, and sunflower are all weeds that would be expected to thrive in the disturbed soils created by human occupation. These weeds probably grew on the trash dumps as well as in the fields. The pollen profiles from Mug House trash slope contain large quantities of their pollen. Apparently they were not considered entirely as pests, since seeds of the first three, at least, were common in the human feces.

Pollen. Although six separate pollen profiles were analyzed, no single one covers the whole time sequence represented by the various Mug House deposits. The separate diagrams are described and interpreted by Martin and Byers (1965), and I will not repeat them here. Instead, I have constructed a composite diagram from pertinent parts of several profiles in an attempt to depict the floral changes that took place in the immediate vicinity of Mug House during the time of its occupation and afterwards (fig. 308). Parts of profiles 8 and 2 from the trash slope and of profile 7 from Kiva G have been used. Where the profiles overlap, there is no exact correlation in percentages of the different pollens, but the trends carry along from one to the next. Thus this diagram should not be read as a precise record of changing proportions within a single stratigraphic column; rather it presents a generalized picture of trends in the floral environment of Mug House.

The early appearance of Douglas-fir pollen and its subsequent total disappearance may indicate that one or more such trees grew very near the cave when Indians first moved in during the 1000's, and that they were soon cut down for building material. Because Douglas-fir pollen does not travel far, the trees must have been growing closer to the cave than today's nearest stand of the species, which is more than 100 yards to the south.

The steady decrease in arboreal pollens throughout the period of occupation may reflect depletion of trees around the site as they were cut for construction purposes and firewood. The sharp rise of tree pollen at the end of the occupation, but before final abandonment may represent an initial recovery of the forest, yet it is hard to explain why this should have begun before the Indians had entirely moved out. After the abandonment there seems to have been steady progress toward reforestation.

As the arboreal pollen decreased proportionately, the weeds that accompany human disturbance—*Cleome* and the cheno-ams—became prominent in the pollen record. These weeds probably grew in profusion on the trash slope from which our profiles recording the occupation were taken. The primary economic plants—corn, beans, and squash—are poorly represented, probably because the fields lay some distance away. The corn and squash pollen must have been brought in as whole plants or parts of plants. We cannot tell whether corn pollen was collected for special purposes, as it is among modern Pueblo Indians.

The following five plants are represented in the pollen record of the 1200's, although we did not recover any parts of the plants themselves:

Ephedra sp.—Mormon tea
Euphorbia sp.—spurge
Sheperdia argentia—silver buffalo berry
Acer sp.—boxelder
Plantago sp.—plantain

Scattered grains of spruce (*Picea*) and alder (*Alnus*) could have blown in on the wind from great distances. The plantain may have grown on the trash slope.

Reconstruction. All of the biological evidence points to a past climate and a natural environment almost identical to that of the present. All of the significant wild plants and animals whose remains came from Mug House can be found on the Mesa Verde today. The tree-ring record exhibits the same kinds of variations now as it did then, although the details are different, of course. Except for recently introduced species, all of the plants and animals found in the vicinity of Mug House now were probably there also around 700 years ago. What differences did exist were most likely brought about by man. The Indians undoubtedly reduced much of what is now woodland to fields, and their presence encouraged an abundance of weeds. They developed sources of water which may have supported water-seeking plants. Their hunting activities may have helped to deplete populations of some food animals.

UTILIZATION OF THE ENVIRONMENT

Basically, the Muguenos were farmers. The growing season, temperatures, and rainfall were adequate for raising corn, beans, and squash without irrigation (Franke and Watson, 1936). The wind-deposited soil was fertile. Artificial terraces built in small drainage channels and on the talus slopes provided some insurance against the extreme dryness and rapid runoff that often plague the dry farmers in southwestern Colorado today. Most fields would have to be cleared before they could be planted, and then they would have to be kept clear of weeds. Wild grazing animals must have threatened the crops continually.

About the only important advantage to be gained from living in a Mesa Verde rock shelter is the ease of defense. It would be far more comfortable and sanitary to live in a house on the mesa top near most of the fields. Temperatures in the caves are unpleasantly cool most of the year, and the advantages of sunshine are minimized. The relatively difficult access to the cliff site would provide some measure of protection against surprise attacks, but would also be a daily inconvenience to the inhabitants.

Rocks and Soils. Sandstones of the Mesaverde group found many uses—as the material used chiefly in masonry walls, as slabs to line bins or close doors, and as the raw material for many tools and utensils, particularly tools for grinding. Shales could be pulverized into pottery clay or simply softened with moisture for use as masonry mortar or flooring. Several of the finer grained soils also saw similar uses in construction. It was necessary to wander a little farther afield in Mesa Verde to acquire hematite nodules suitable for paint or beds of chert that could be chipped into tools. At the southern ends of Chapin Mesa and Moccasin Mesa there are alluvial gravels containing igneous and metamorphic rocks similar to those used for tools and pottery temper. The volcanic breccias of some grinding tools may have come from a volcanic plug near the southern end of Wetherill Mesa, or from some other similar source.

Animals. Four wild species seem to have been important sources of food: cottontail, mule deer, wood rat, and rock squirrel. Other animals may have been eaten occasionally. The hides of deer, rabbit, and squirrel were used in blankets, pouches, and tumpline bands. Bone tools were made from the skeletal elements of deer, bighorn sheep bobcat, and coyote, while cottontail and jackrabbit tibias were perforated for some unknown reason.

Turkeys may have been domesticated at Mesa Verde by the ancient Basketmakers, or they may have been introduced as domesticated birds from elsewhere. In either event, in 13th-century Mug House the birds provided feathers for blankets and bones for tools and ornaments, and they were an important source of meat. Apparently other wild birds were not eaten, although feathers from several were found in the ruin and ornaments were made from some bones of the golden eagle and Canada goose. One enterprising "jeweler" turned a group of land snails into a necklace.

Plants. The important triad of cultivated plants was certainly introduced to the Mesa Verde by the Indians. Cotton was either similarly introduced, or acquired through trade. Among the weeds that followed the agricultural plants or increased in abundance with their arrival, the seeds of several were eaten.

In spite of the probable numerical dominance of pinyon in the mesa-top woodland, juniper was by far the most popular wood for construction. The 59 pieces of juniper still *in situ* include 13 main roof timbers, 12 smaller roofing pieces, 19 sticks in doorway lintels or as doorstops, 7 wall pegs, and 8 poles stretching between pilasters in kivas. In addition, 76 specimens collected for tree-ring dating and most of some 267 unworked sticks, splinters, and shakes of juniper probably came from collapsed roofs. Roof adobe impressions show that juniper bark made up considerable portions of some roofs. Several juniper berries and seeds were found beneath some of the clay floors, but there is no direct evidence that these were eaten. The many pieces of juniper charcoal suggest that this species was often used for fuel. A digging stick and a probable batten were made of juniper.

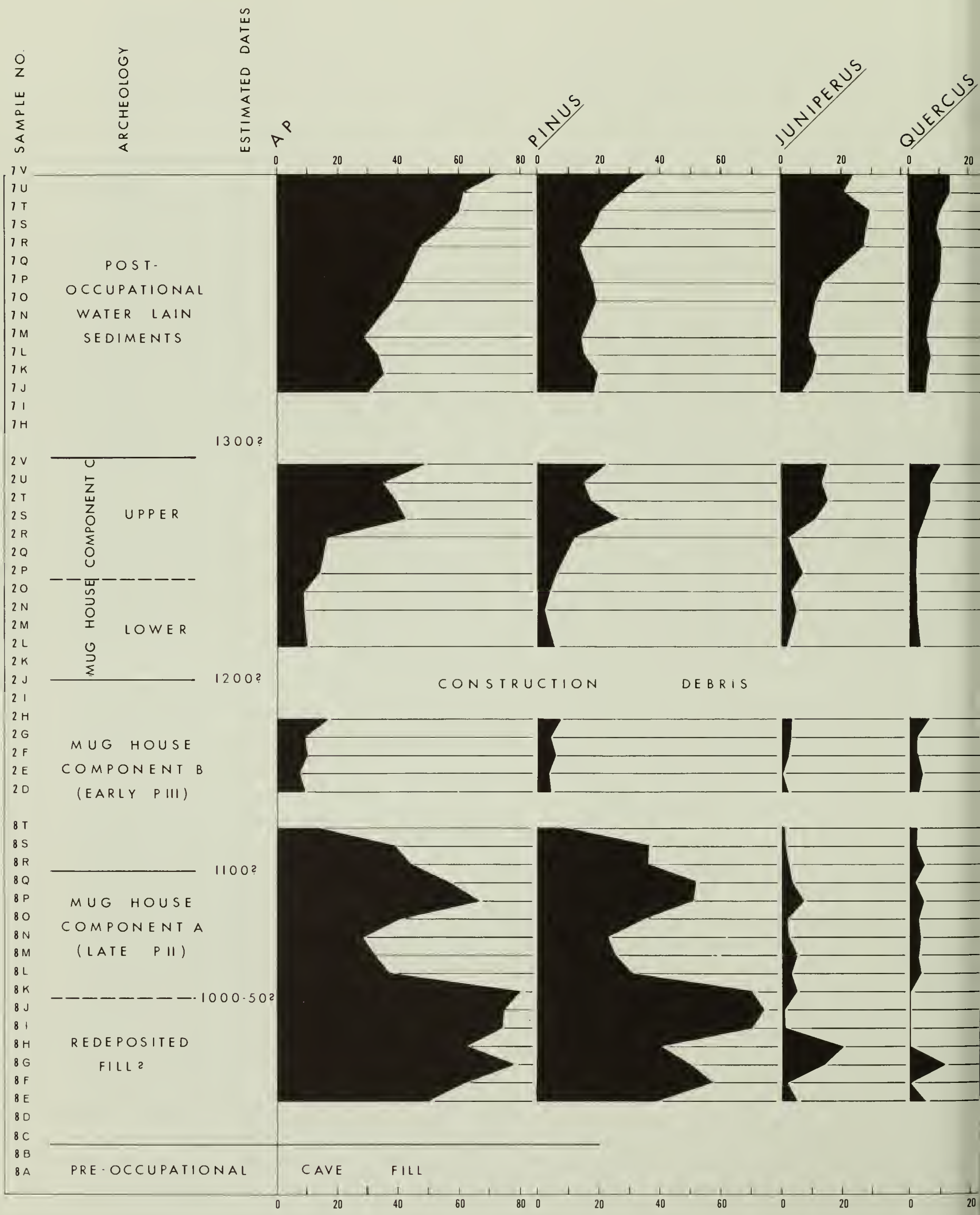
No tools were made from pinyon. It was apparently used mainly in house roofing. Four *in situ* specimens include two main roof beams, one smaller roof pole, and one suspension pole. Forty tree-ring specimens probably once formed parts of roofs. The many charred pieces suggest that it was used extensively for fuel. Pinyon nut shells were found beneath several floors, but there is no direct evidence that they were eaten.

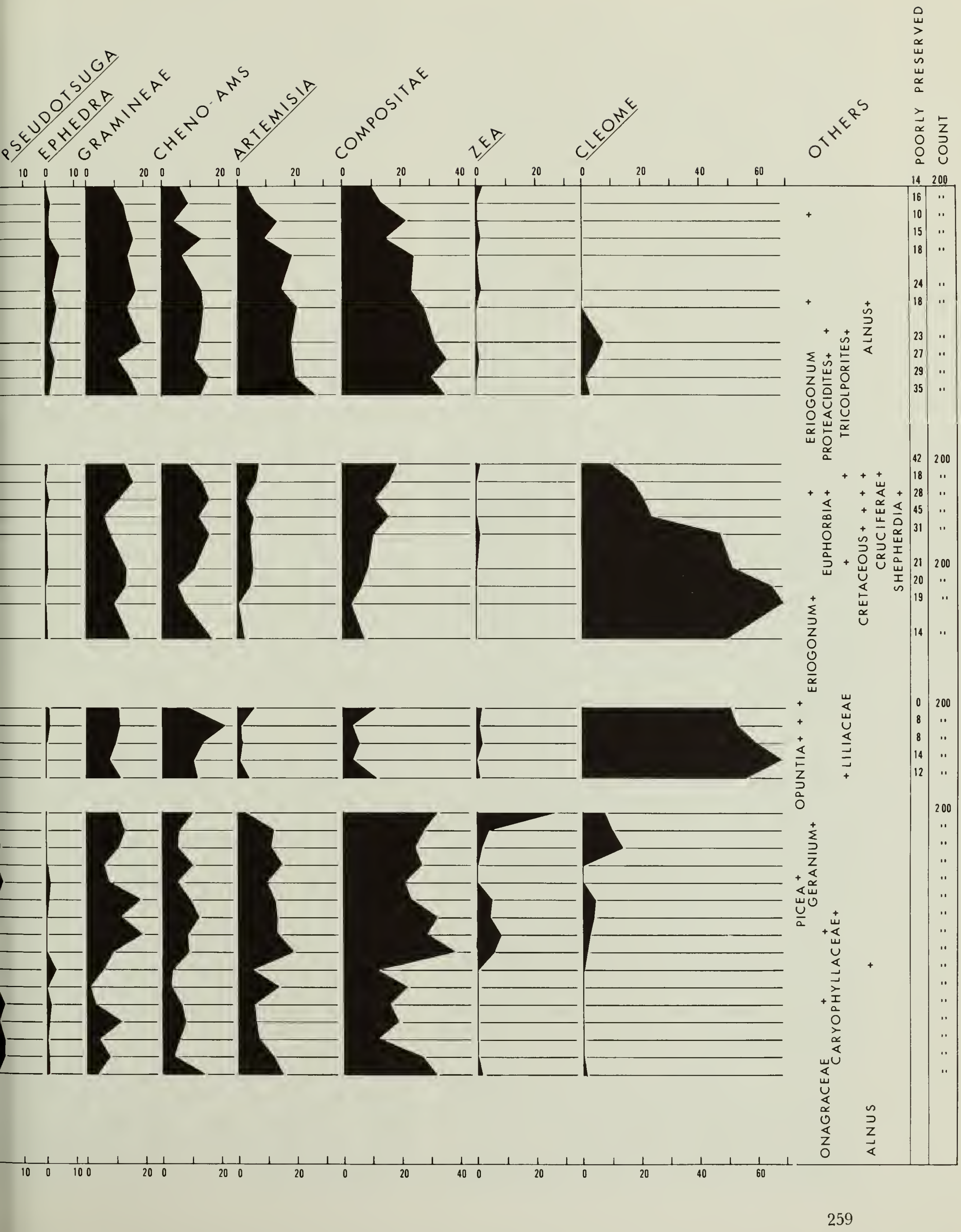
Pinyon pitch coated the interiors and some exteriors of many corrugated sherds, occasionally covering the broken edges. At least one deeply eroded sherd was coated. Apparently pitch was used to fill cracks in corrugated pots and to line entire pot bottoms with a layer from 0.1 to 0.5 cm. thick, probably to reduce water loss through the porous vessel walls. Large lumps on the exterior base could have helped seat a pot in a permanent storage position beneath a floor. The pitch ranged in color from a clear orange through a dark red-brown to brown-black. Its glassy textured core suggests that the pitch was heated and applied to the pots while fluid. As a mending agent, pitch was applied only to the corrugated pottery. Black-on-white pottery was repaired by drilling pairs of holes and tying the pieces together with sinew or yucca-leaf strips and cordage.

Ponderosa pine is represented in Mug House by one tree-ring specimen, one chip, and three pieces of bark. A cradle sideboard and a wooden pillow identified as *Pinus* sp. may be of this species. The scarcity of ponderosa pine suggests that it did not grow near Mug House.

Douglas-fir was used only in construction. Five *in situ* pieces included four main roof beams and one wall peg. We collected 49 loose, probable roofing specimens for tree-ring dating. Douglas-fir made up a larger proportion

308 Composite pollen profile of Mug House.




PSEUDOTSUGA
EPHEDRA
GRAMINEAE
CHENO-AMS
ARTEMISIA
COMPOSITAE
ZEA
CLEOME
OTHERS
POORLY PRESERVED
COUNT
10 0 10 0 20 0 20 0 20 0 20 40 0 20 0 20 40 60
ERIOGONUM
PROTEACIDITES+
TRICOLPORITES+
ALNUS+
EUPHORBIA+
CRETACEOUS+
CRUCIFERAE+
SHEPHERDIA+
ERIOGONUM+
LILIACEAE
OPUNTIA+
GERANIUM+
PICEA+
CARYOPHYLLACEAE+
ONAGRACEAE
ALNUS
14 16 10 15 18 24 18 23 27 29 35
42 18 28 45 31 21 20 19 14
0 8 8 14 12
200
200
200
200
200

of Component A roof timbers than Component C timbers. Many of the Component B roofs were built of older, re-used timbers.

Aspen is represented only by pieces of bark that may have been carried in from some distance. A large object of unknown purpose was made from aspen bark. One fire-drill hearth was either aspen or cottonwood.

The many uses to which oak was put reflect both its toughness and the flexibility of its young stems. The hard wood was made into seven digging sticks, two of which later became doorstops, one club or digging stick, a stirring paddle, and a poker. There are six oak wall pegs and five oak doorstops, including the two re-used digging sticks still in place in the ruin. The combination of flexibility and toughness made them ideal for wall loops (21 are still *in situ* and 5 were found loose), handles for the three axes and hammers that still retained parts of them, and rings for the two twilled yucca baskets. The 15 bits of foliage and leaves found beneath floors may indicate that oak brush grew adjacent to Mug House cave. We found 29 acorns in a niche in Kiva C, but we have no indication as to why they were put there.

Skunkbush was the only other plant used for wall loops. Seven loops and one wall peg of this species were found in place. The 19 unworked sticks of skunkbush may have formed parts of layers in some roofs, together with similar sticks of serviceberry, mountain-mahogany, saltbush, greasewood, mockorange, sagebrush, rabbitbrush, and gooseberry, and possibly the few unworked sticks of chokecherry, bitterbrush, and snowberry. Skunkbush fruits were eaten.

Serviceberry was one of the most common woods used in construction and in the manufacture of artifacts. There are, *in situ*, 30 wall pegs, 9 doorstops including 3 re-used digging sticks, 5 sticks in doorway lintels, and 2 sticks crossed in an old ventilator in Room 11. Four loose wall pegs, 19 three-ring specimens, and 54 unworked sticks of this species were all probably once parts of buildings. Ten digging sticks, three of which were used in doorways, five fire pokers, and one fire drill constitute the artifacts of serviceberry.

Mountain-mahogany saw the same kinds of use as serviceberry. There are five in-place wall pegs, two sticks in doorway lintels, and one piece in a roof. Five digging sticks, one of which ended up in a doorway, two forked sticks, one awl, and one probable batten were all made from this shrub. The 35 unworked sticks of mountain-mahogany may have been roofing.

Aside from its probable use in roofing, saltbush was employed for one in-place doorstop, one digging stick, one arrow foreshaft, and one poker, while greasewood appeared *in situ* once as a wall peg. One fire drill and one fire-drill hearth were made from sagebrush. Rabbitbrush rods appeared in the foundations of three coiled baskets or basket fragments. One arrow foreshaft was made from mockorange. Fendlerbush provided the majority (6) of wooden awls. One awl was made from chokecherry. Elderberry appeared only twice—as a wall peg and as a doorstop in the same room.

Willow provided the most common matting and basketry material. We recovered 312 rods that had been sewn into mats. All seven coiled baskets and fragments were stitched with willow strips and five had willow rods in their foundation coils. Seventy-six unworked sticks look as if they had been intended for use in roofing. There were three *in situ* wall pegs of willow.

Segments of reeds were made into arrow shafts (3) and cigarettes (14), and at least 27 stems went into the making of a mat. The 282 unworked stems, many with leaves attached, seem to have fallen as part of one or more roofs in the vicinity of Kiva B. Many of these stems were too thin to have been made into arrow shafts or cigarettes.

Yucca was apparently the most important single plant for the manufacture of clothing and household utensils. The leaves were split into strips, which were often knotted into crude nets, or used in twilled baskets and sandals, or bundled together to form pot rests. Yucca-leaf fibers were twisted into cordage that frequently was made into feather blankets, tumpline headbands, socks, and twined sandals. Yucca cordage also served as the binding agent in matting. Two woven pot rests were made with the narrow-leafed yucca, but all strips were split from leaves of the broad-leafed yucca. Nine pods and 18 seeds may indicate that yucca fruits were gathered for food, although we found no remains in any of the feces. Yucca quids were chewed. There is no evidence to suggest that yucca roots were used for soap, as in historic times.

The many crowns of Indian ricegrass suggest that entire plants were brought into Mug House. Some of the charred crowns may have been torches; bunches of the grass could have been used for bedding. Rushes appeared only in twilled matting. Pigweed was chewed. Pigweed, goosefoot, beeplant, prickly pear, ground cherry, and miner's lettuce were definitely eaten, and the wild onion and sunflower may have been collected as food. The uses of the other plants found—mutton grass, junegrass, barley, cattail, milkvetch, sedge, Jacob's ladder, virgin's bower, and buckwheat—are not known.

TRADE

Mug House contained very few materials or items that could not have been acquired locally. The Muguenos apparently gathered most of their raw materials themselves and made their own tools and utensils, or they traded with their close neighbors for them. For example, they may have "bought" the stone materials found in the old Mancos River gravels at the south end of Chapin and Moccasin Mesas from other Mesa Verdeans, or they may have made periodic journeys to the gravel deposits themselves. Beyond this local scene, however, interchange through trade seems to have been extremely limited.

Perhaps one of the best indicators of trade is pottery. One might think that the Muguenos had enough fine pottery of their own making to preclude their wanting more. But they made no red ware and several of the imports were reds and polychromes. Some of the pottery vessels may have been containers for other commodities. Several other pieces may have been traded as sherds. A listing of all the pieces of pottery from Mug House that appear to have originated outside the region of Mesa Verde culture follows.

From northeastern Arizona (identified by A. J. Lindsay, Museum of Northern Arizona):

Tusayan White Ware—2 sherds from 1 jar
Tusayan Corrugated—2 sherds from 2 jars (probably Component C)
Tusayan Black-on-red—1 large bowl sherd (probably Component A)
San Juan Red Ware (possibly La Plata Black-on-red)—1 bowl sherd

From the Little Colorado River drainage (identified by Roy Carlson, University of Colorado, and by William Wasley, Arizona State Museum):

St. Johns Polychrome—1 restored bowl (Component C)
Wingate Polychrome (Houck Var.)—1 bowl sherd (Component C)
White Mountain Red Ware—2 sherds from 2 bowls

From northwestern New Mexico:

Red Mesa Black-on-white—1 jar sherd
Chaco Black-on-white—3 sherds from 1 pitcher (Component A)

From Pine and Piedra River valleys:

Arboles (?) Black-on-white—1 bowl sherd

The very attractive hornfels from which many tchamahias were made is known to come from near the Four Corners area of Arizona. A round trip to this spot could have been made on foot in 2 or 3 days, or the materials may have passed through several intermediate hands before arriving at Mug House. Probably most of the chalcedonies and some cherts used to make fine chipped tools such as arrow points and knives were also imported from surrounding areas. The petrified wood of the small tablets may have come from Arizona or New Mexico.

The most exotic trade item in Mug House is the small pendant made from part of a conus shell. This shell originated somewhere along the Pacific Coast and probably was a part of many swaps before some Mugueno bartered for it.

As yet, it is impossible to determine if several other items were also acquired in trade or if they formed a part of the available local resources. Because no seeds or other parts of cotton plants have been found in Mesa Verde's cliff dwellings and because several recent attempts to grow cotton locally have failed, it would seem that the raw cotton or the finished products must have been traded into Mesa Verde. However, our knowledge is still too scant to allow us to say with much certainty that cotton was *not* grown here. The growing season is long enough to support the hardy Hopi cotton used by the Pueblos today.

Several of the animal bones may also have come into Mug House through trade with immediate neighbors. Since so few other parts of the body are represented, many or all of the bighorn sheep humeri and jackrabbit tibias in Mug House may have been obtained from persons outside. Another trade item may be the necklace of golden eagle and Canada goose ulnas; or possibly just the bones were traded. The single bones of whistling swan, wapiti, and wolf may also have been brought in.

We should not overlook the possibility that all of these products could have had a local origin among the Muguenos. It would also seem likely that such commodities as salt, meat, hides, feathers, and paints were traded among the ancient Pueblos and their neighbors.

UNTAPPED RESOURCES

Since the environment of the 13th century was essentially the same as that of today, did the Muguenos overlook any important resources? Apparently a few. We found no positive indication of the gathering and eating of pinyon nuts, juniper berries, chokecherries, gooseberries, and several other wild fruits, although these are regularly eaten by most historic Southwestern Indians.

Wildfowl, such as grouse and ducks, bighorn sheep, elk, and fish were virtually absent from the food bone refuse in the trash. These may have been available only at some distance from Mug House.

Perhaps the most important untapped resource was coal. If coal had been burned, houses would have been warmer, cooking more efficient, and the pottery better fired. Archeologically, we would have seen the difference in the quality of pottery and in the ashes in the hearths, but we would probably not have seen any really significant change in basic culture. The Muguenos made good use of their environment, probably as complete a use as could be made without a more advanced technology and without the benefits of extensive trade.

RECONSTRUCTION OF LIFE IN MUG HOUSE

Economy. The cultivation of corn, beans, and squash clearly dominated the subsistence pattern of the Mug House Indians. Domestic turkeys provided a steady supply of meat as well as raw materials for the manufacture of clothing and tools. The hunting of cottontail, deer, wood rats, and squirrels supplemented the domestic meat supply and added still other raw materials for manufacture. The seeds and fruits of several weeds and native wild plants, including prickly pear, pigweed, goosefoot, beeplant, ground cherry, miner's lettuce, and skunkbush were gathered for food.

Tools of the trade were the digging stick for agriculture, the stone ax for clearing land, the bow and arrow for hunting, and sharp-edged stone flakes for cutting. We found no evidence of spears or traps and snares. While plots of rich loose soil, in which runoff water could be concentrated, were created by terracing small drainage channels and some hillsides, most fields were on the top of the mesa and depended for moisture on intermittent precipitation.

Water was caught and stored in a reservoir at the base of the cliff a short distance south of Mug House. When the reservoir dried up, water had to be hauled from one of two springs up to 1½ miles away. Water may well have been the most precious single commodity in Mug House, and may have been stored in some quantity through the dry periods.

Arts and Crafts. Technologically, the Muguenos were a stone-age people. They made their tools from stone, bone, antler, and wood. Perhaps their finest handicraft, both technically and artistically, was pottery. They practiced basketry, weaving, and leatherworking in a somewhat elementary fashion. Esthetically, they expressed themselves almost exclusively by painting—designs on pottery, patterns and figures on plastered walls, and perhaps decorations on the human body and apparel. Stone sculpture and wood carving were virtually nonexistent. Geometric designs and conventionalized figures predominated. Naturalistic scenes and representations of animals or men were totally absent.

While we are constantly amazed at the amount of work required to make many of the stone tools, it is surprising how many shortcuts the Mug House artisans took. They made very few finished knives or drills, but used instead the sharp edges or points fortuitously occurring on random stone flakes. The scrapers and choppers, if found by themselves, would suggest the crudest stoneworking industries. Even the stone axes and hammers were generally made from stream cobbles that required a minimum of work to achieve the desired shapes. These tools were never brought to a perfect finish over their entire surface.

In spite of so much poor quality workmanship, there must have been some standards of excellence to which many Indians aspired. One only needs to examine closely two walls standing side by side or one on top of the other to observe how one mason carefully dressed the faces of each stone he set in the wall, while his neighbor did a minimum of shaping. One doorway will have neatly ground jambs, while another will have rough edges and only a stick beneath the lintel to support the door slab. One household obviously preferred only the hard wood of serviceberry for wall pegs and doorstops, while another used any material that happened to be handy. A quick glance through the illustrations of pottery vessels from Mug House will point up similar variations in vessel construction, finishing of surfaces, and the application of designs. Even in the stone and bone tools, some craftsmen expended the time and effort necessary to produce a completely chipped knife or drill, or to work down the articular head of a bone awl to a smoothly rounded end.

Re-use and Repair. The ancient inhabitants of Mug House cannot be considered a wasteful people. They found a use for most parts of the plants and animals they gathered for food. They even found a source of food in the weeds that sprung up about them. Their frugality is nowhere better exemplified than in the degree to which they saved and mended old or wornout materials. Primary sources for building stones and timbers were the older abandoned houses around them. They systematically robbed the buildings in Adobe Cave and Site 1227, and of Component A in Mug House cave. Old stone tools were reshaped and used for other purposes. Dulled axes became hammers; broken axes and hammers and dulled choppers usually became hammerstones; broken manos and metates frequently became grinding stones or abraders. Most waste stone flakes saw use for cutting or scraping before being discarded. Waste cores almost always were turned into hammerstones.

Broken or cracked pottery vessels were often mended with pitch or by tying pieces together with yucca strips or twine. The only complete piece of footgear we found, the netted sock, had been rather extensively mended. Nothing was discarded as long as there was hope of getting some use out of it.

The material culture of Mug House could be characterized in general as one of scarcity. Neither raw materials nor prepared materials, like cordage, were stockpiled, and waste products from artifact manufacture were rare. Some of the stone objects found on the kiva banquettes had already been used, and many broken tools were saved, apparently for later re-use. Little of value, if anything, was placed in graves with the dead. Luxury goods were extremely rare and were invariably made of local materials, possibly because of the feebleness of trade. Such frugal habits may also reflect a culture that emphasized conservative values.

Population. We can never know exactly how many people lived in Mug House at any one time. The ruin certainly would not accommodate many modern-day Americans used to living in spacious homes. From detailed descriptions of households in the modern pueblos of Laguna (Parsons, 1923) and Zia (White, 1962), we might project into the past an average household of four or five individuals, including children. Since we have estimated that perhaps 20 households lived in Mug House, if we consider that all the rooms were occupied at the same time (and we know they were not, since some were used as trash dumps), we may estimate a maximum population of between 80 and 100 persons at any one time. Few adults survived 40 years and probably over half the children died before reaching 4 years of age. Many living Muguenos must have been subadults.

Social and Ceremonial Organization. In my analysis of the layout of Mug House in ch. 2, I suggested that the household and community functioned as primary organizational units, and the courtyard unit and dual division were of lesser importance. The specialization of ceremonial architecture in kivas and towers would seem to indicate that there was a well-developed religious organization. Structural details clearly distinguished between ceremonial and secular construction. Yet the differences in details from one kiva to the next—the presence versus absence of a sipapu, six pilasters versus no pilasters, square versus round shape, the placement of niches, and so forth—imply differences in the religious requirements of the different groups using the kivas and hence the probable development of the separate kiva societies common to the modern pueblos. We may also suppose the partial skeleton of a turkey in Kiva D and of cottontails in Kiva H signified some supernatural affiliation. From the number of kivas active up to the time of abandonment, we may estimate the presence of five or six separate kiva societies.

Disease and Sanitation. The many early deaths in Mug House suggest that disease was a constant threat. We observed some defects from the bones, but few, if any, of these would have been the actual cause of death. We can well imagine how the practice of dumping garbage in the nearest convenient place, such as in the empty room next door or on the trash dump in front of the cave, and of unburdening human waste products in similar locations would foster the production of untold microorganisms. The average village on the mesa top would be protected somewhat by the sterilizing effects of the sun's rays. But the cave site is denied this advantage for much of the time, and parts of it behind the buildings would receive no direct sunlight at all.

CULTURAL CHANGES

Several cultural changes were registered in Mug House during its occupation. In architecture, the habitation-unit layouts of Components A and B were submerged by the amalgamation of rooms and kivas into the large Component C pueblo. The Component A building stones with chipped edges were superseded by rectangular stones with pecked and ground faces in the two later components.

Except for shifts in pottery styles, material culture changed little. There seems to have been a decrease in trade and the acquisition of luxury goods. Perhaps this is what has caused the appearance of poverty. Such artifact types as bone humerus scrapers, tchamahias, and stone tablets were added to the assemblage during Pueblo III and possibly were restricted to Component C. The older troughed metates with their associated manos were present in Component A, but disappeared completely afterward.

The economy also changed very little. Most notable is the increased utilization of the turkey. Where tools made from deer bones predominated in Component A, turkey bone artifacts constituted the majority in Components B and C. Larger proportions of unworked turkey bones in the later refuse reflect its greater use for food.

We may wonder if the increasing importance of the turkey as a food source represents a further sophistication of culture, or whether more and more hunters so destroyed the game animals locally that a substitute meat source had to be developed. A third possible explanation may be that hunters found it increasingly dangerous to range afield after game. If free movement became restricted, as seems to be suggested by an apparent decrease in trade contacts and the tendency to repair and re-use many objects, then hunting would be curtailed. Of course, such restriction in freedom of movement could have been brought about by the gradual immigration of not always friendly hunting and gathering peoples onto the lands traditionally occupied by Puebloan peoples.

The population in Mug House grew steadily from Component A through Component B, reaching a peak in Component C. Ultimately, everyone moved away. We believe that descendants of these people are living today among the Pueblo Indians of New Mexico and Arizona, but we do not know why the Muguenos themselves left their homes.

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appendix: room descriptions

Room 1

Size—9.6 to 11.4 feet long by 7.5 to 9.2 feet wide; 2.4 to 5.4 feet high.
Floor—unmodified bedrock leveled in places with gray clay.
Walls—1 shared with Rooms 2 and 3; 1 unmodified bedrock cave wall: 2 single-coursed with buff mortar, no shaped or dressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—D-shaped hearth against one wall; 1 T-shaped doorway plugged; access through another doorway to Room 2; floor level ventilator; 1 wall peg.
Remarks—apparently built as a unit with Rooms 2 and 3.
Use—dwelling.

Room 2

Size—5.8 feet long by 5.6 feet wide; 2.4 to 4.6 feet high.
Floor—unmodified bedrock.
Walls—1 shared with Room 5; 1 unmodified bedrock cave wall; 2 single-coursed with buff mortar, no shaped or dressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway.
Remarks—an old hearth blackened the cave roof before this room was built. Apparently built as a unit with Rooms 1 and 3.
Use—storage.

Room 3

Size—3.8 to 6 feet long by 5.2 feet wide; 4.6 to 5.7 feet high.
Floor—unmodified bedrock.
Walls—1 shared with Room 2; 3 single-coursed with tan mortar, undressed stones: no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 1 loophole.
Remarks—space of Rooms 1, 2, and 3 was originally enclosed as a single room with a hearth where Room 3 now is; later remodeling included the partitioning of the larger space into Rooms 1, 2, and 3.
Use—sleeping.

Room 4

Size—3.6 to 6.6 feet long by 5.2 feet wide; 4.8 to 6 feet high.
Floor—unmodified bedrock and gray clay.
Walls—1 shared with Room 5; 1 shared with Room 3 2 single-coursed with buff mortar, undressed stones no plaster.
Ceiling—unmodified cave roof.
Features—former corner hearth; rectangular doorway 1 wall peg; 1 wall niche.
Use—sleeping (children ?).

Room 5

Size—7.2 feet long by 3.5 feet wide; 4.2 to 5.5 feet high.
Floor—unmodified bedrock.
Walls—4 single-coursed with tan mortar, very few pecked stones; no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 3 wall pegs; 1 small shelf.
Use—possibly dwelling at first, storage afterward.

Room 6

Size—4.6 feet long by 3.8 feet wide; 3.9 to 5.2 feet high.
Floor—unmodified bedrock.
Walls—1 shared with Room 5; 3 single-coursed with light brown mortar, very few pecked stones; no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 1 wall peg; 1 small corner shelf.
Use—storage.

Room 7

Size—5 feet long by 3 feet wide; 5.3 to 6 feet high.
Floor—unmodified bedrock, and gray clay.
Walls—1 shared with Rooms 5 and 6; 1 shared with Room 4; 1 shared with Room 9; 1 single-coursed with buff mortar, 1 pecked stone; plaster only around doorway into Room 5.
Ceiling—unmodified cave roof.
Features—former corner hearth; access doorway into Room 5; 1 wall peg.
Remarks—there must have been a doorway into the room aside from that leading to Room 5.
Use—storage.

Room 8

Size—2.9 feet long by 1.7 to 3.1 feet wide; 5.7 to 6.8 fee high.

Floor—packed dirt.
Walls—1 shared with Room 6; 1 shared with Room 9; 1 shared with Room 7; 1 single-coursed with tan mortar, undressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—1 doorway.
Use—passageway; storage ?

Room 10/1

Size—10.3 feet long by 7.5 feet wide; 5.7 to 6 feet high.
Floor—pecked bedrock.
Walls—4 single-coursed with reddish brown mortar; many re-used chipped-edge stones, some pecked; 1 zone of monochrome plaster.
Ceiling—split shake and pole.
Features—corner hearth; 2 rectangular doorways; floor level ventilator; 2 wall niches; 1 wall peg.
Use—dwelling.

Room 10/2a

Size—10.2 feet long by 3.8 feet wide; 2.6 to 3 feet high.
Floor—roof of lower room.
Walls—1 completely gone; 3 single-coursed with pink mortar, undressed stone; no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 1 wall peg.
Use—dwelling or storage.

Room 10/2b

Size—10.3 feet long by 3.2 feet wide; 3 to 3.4 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 10/2; 1 completely gone; 2 single-coursed with pink mortar, undressed stone; no plaster.
Ceiling—unmodified cave roof.
Features—corner hearth; 1 rectangular doorway (plugged).
Use—dwelling or storage.

Room 11/1

Size—9.2 feet long by 7.2 feet wide; 5.5 to 5.9 feet high.
Floor—pecked bedrock with patches of packed dirt.
Walls—1 shared with Room 12/1; 1 shared with Room 10/1; 2 single-coursed with tan mortar, many re-used chipped-edge stones; lower 2 to 3 feet of walls plastered pink.
Ceiling—split shakes and pole.
Features—central circular hearth; access through doorway to Room 12/1; 2 floor level ventilators (1 plugged); 7 wall pegs.
Use—dwelling.

Room 11/2

Size—9.2 feet long by 7.2 feet wide; 2.6 to 3.6 feet high.
Floor—roof of lower room.
Walls—1 shared with Rooms 10/2 and 10/3; part of 1 shared with Room 12/2; 1 completely gone; 2 single-coursed with tan mortar, some pecked stones; plaster patch around 1 doorway.
Ceiling—unmodified cave roof.
Features—hearth against wall; 1 rectangular doorway; access through 2 other doorways to Rooms 10/2 and 10/3; 3 wall loops around doorway; floor level ventilator; 1 loophole; 1 wall peg.
Use—dwelling.

Room 12/1

Size—10 feet long by 6.8 feet wide; 5.5 to 6.1 feet high.
Floor—unmodified bedrock.
Walls—4 single-coursed with pink mortar, few pecked faces, re-used chipped-edge stones; no plaster.
Ceiling—split shake and pole.
Features—3 rectangular doorways; 1 probable additional doorway; 8 wall pegs.
Use—dwelling.

Room 12/2

Size—10.2 feet long by 3.2 feet wide; 2.2 to 3 feet high.
Floor—roof of lower room.
Walls—4 single-coursed with pink mortar, no shaped or dressed stones; monochrome plaster on interior faces.
Ceiling—unmodified cave roof.
Features—2 wall pegs.
Use—dwelling.

Room 13

Size—6 feet long by 4.7 feet wide; 5.6 to 6.4 feet high.
Floor—packed dirt.
Walls—1 shared with Room 11; 1 shared with Room 14; 2 single-coursed with pink mortar, undressed stone; no plaster.
Ceiling—unmodified cave roof.
Features—none.
Remarks—the room must have been entered through a now missing doorway in one of the walls.
Use—storage.

Room 14

Size—6.6 feet long by 4.5 feet wide; 5.6 to 6.7 feet high.
Floor—pink clay.
Walls—1 shared with Room 12; 3 single-coursed with pink mortar, undressed stone; monochrome plaster around exterior of doorway.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 11 wall pegs.
Use—storage.

Room 15/1

Size—8.9 feet long by 6.5 to 7.7 feet wide; 5.3 to 5.9 feet high.
Floor—unmodified bedrock.
Walls—4 single-coursed with pink mortar, a few re-used chipped-edge stones, some pecked stones; no plaster.
Ceiling—split shake and pole.
Features—1 rectangular doorway; 7 wall pegs; wall ventilator; small shelf.
Remarks—ceiling was dismantled by people at unknown time.
Use—dwelling or storage, or both.

Room 15/2

Size—9.2 feet long by 7.2 to 8.1 feet wide; 1.4 to 3.8 feet high.
Floor—roof of lower room.
Walls—4 single-coursed with brown mortar, a few pecked stones; monochrome plaster covers interior.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway.
Use—probably storage, possibly dwelling.

Room 16

Size—3.5 feet long by 2.8 feet wide; 2 to 4.6 feet high.
Floor—unmodified bedrock.
Walls—1 shared with Room 17; 1 shared with Area V; 1 unmodified bedrock cave wall; 1 single-coursed in buff mortar, some pecked stones; no plaster.
Ceiling—unmodified cave roof.
Features—none.
Use—storage.

Room 17

Size—6.2 feet long by 4.4 to 5.3 feet wide; 2.1 to 5.8 feet high.
Floor—unmodified bedrock and packed dirt.
Walls—4 single-coursed with pink mortar, some pecked and ground stones; no plaster.
Ceiling—unmodified cave roof.
Features—none.
Use—storage.

Room 18

Size—3 feet long by 2.7 feet wide; 0 to 2.8 feet high.
Floor—unmodified bedrock.
Walls—1 shared with Room 17; 1 shared with Room 19; 1 unmodified bedrock cave wall; 1 single-coursed with buff mortar, few pecked stones: no plaster.
Ceiling—unmodified cave roof.
Features—none.
Use—storage.

Room 19

Size—7.5 feet long by 5.6 to 6.8 feet wide; 0 to 5.8 feet high.
Floor—unmodified bedrock.
Walls—1 shared with Room 20; 1 unmodified bedrock cave wall; 2 single-coursed and double-coursed with buff mortar, some pecked stones; monochrome plaster on 1 wall.
Ceiling—unmodified cave roof.
Features—corner hearth.
Remarks—part of this room was once a small storage room.
Use—dwelling.

Room 20

Size—6.2 feet long by 3.7 feet wide; 1.1 to 3.8 feet high.
Floor—unmodified bedrock; tiny patch of packed dirt.
Walls—1 shared with Room 21; 1 unmodified bedrock cave wall; 1 single-coursed with buff mortar; 1 double-coursed with buff mortar; 1 pecked stone; buff plaster around both doorways.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; access through another doorway into Room 21; 1 wall peg.
Use—storage.

Room 21

Size—12.3 feet long by 3.3 to 6.2 feet wide; 0.9 to 3.4 feet high.
Floor—unmodified bedrock.
Walls—1 unmodified bedrock cave wall; 3 single-coursed with light brown mortar, no shaped or dressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway.
Remarks—an old hearth located here blackened the cave roof before the room was constructed. Low ceiling permits only crawling.
Use—storage.

Room 22/1

Size—6.1 to 8.6 feet long by 5.4 feet wide; 7.4 feet high.
Floor—3 floors of orange-brown clay.
Walls—1 shared with Rooms 24/1 and 23; 1 unmodified bedrock cave wall; 2 single-coursed with brown mortar, undressed stones; may have been plastered.
Ceiling—wood and dirt.
Features—rectangular hearth against wall; 1 loophole.
Remarks—3 dismantled grinding bins on lowest floor.
Use—dwelling; probably work room when earliest floor in use.

Room 22/2

Size—3.1 to 5.6 feet long by 5.4 feet wide; 2.2 to 6.2 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 24/2; 1 unmodified bedrock cave wall; 2 completely gone; pink plaster on lower part of only wall.
Ceiling—unmodified cave roof.
Features—access through doorway to Room 24/2; 1 wall niche.
Use—dwelling.

Room 23

Size—10 feet long by 2.8 to 5.2 feet wide; 0 to 5.7 feet high.
Floor—pink clay.
Walls—1 shared with Room 24; 1 shared with Room 25; 1 completely gone; 1 unmodified bedrock cave wall; no plaster.
Ceiling—unmodified cave roof.
Features—none.
Remarks—access must have been through a now missing doorway.
Use—storage.

Room 24/1

Size—7.6 feet long by 5.9 feet wide; ca. 6.5 feet high.
Floor—red clay.
Walls—1 single-coursed with pink mortar; some pecked stones; 3 double-coursed with brown mortar, pecked stones; monochrome plaster on 1 wall.
Ceiling—entirely gone (wood and dirt).
Features—corner hearth; 1 wall peg.
Remarks—must have been entered through a now missing doorway from Courtyard G.
Use—dwelling.

Room 24/2

Size—7.6 feet long by 5.9 feet wide; 3.2 to 5.4 feet high.
Floor—roof of lower room.
Walls—2 entirely gone; 2 single-coursed with pink mortar, pecked stones; bichrome decorated plaster.
Ceiling—unmodified cave roof.
Features—hearth; 1 rectangular doorway.
Use—dwelling.

Room 25

Size—5.6 feet long by 5.1 feet wide; 5 to 5.7 feet high.
Floor—unmodified bedrock and brown clay.
Walls—1 shared with Room 26; 1 unmodified bedrock cave wall; 2 single-coursed with interior veneer and tan mortar, pecked stones; monochrome plaster around doorway exterior only.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 2 wall pegs; 2 wall loops.
Use—dwelling or storage, or both.

Room 26

Size—10 feet long by 5.5 to 12.6 feet wide; 4.7 to 5.9 feet high.
Floor—3 floors combining pecked bedrock, clay, and packed dirt.
Walls—1 completely gone; 1 unmodified bedrock cave wall; 2 single-coursed with buff mortar, undressed stones; patches of monochrome plaster near floor.
Ceiling—unmodified cave roof.
Features—1 T-shaped doorway; 1 wall niche pecked in bedrock.
Use—dwelling.

Room 28

Size—6.2 feet long by 3.5 to 4.5 feet wide; 0 to 5.5 feet high.
Floor—unmodified bedrock and clay.
Walls—1 shared with Room 29; 1 unmodified bedrock cave wall; 2 single-coursed with light brown mortar, undressed stones; monochrome plaster on lowest 1.5 feet.
Ceiling—unmodified cave roof.
Features—corner hearth; 2 rectangular doorways
Use—dwelling.

Room 29/1

Size—6.5 to 8 feet long by 7.6 feet wide; probably 6.2 feet high.
Floor—4 packed dirt surfaces.
Walls—1 shared with Room 32; 1 unmodified bedrock cave wall; 1 single-coursed with tan mortar; 1 large slab-based, single-coursed.
Ceiling—most likely split shakes and poles.
Features—6 grinding bins associated with one of the older surfaces.
Remarks—grinding bins had been dismantled before final floor surface; this space seems to have been a dump at some time in its history.
Use—work, dump, at different times.

Room 29/2

Size—ca. 6.5 feet long by 2 feet wide; ? high.
Floor—roof of lower room.
Walls—1 unmodified bedrock cave wall; 3 completely gone.
Ceiling—possibly twigs over poles.
Features—none left.
Remarks—former presence of this room known only from mud lines.
Use—?

Room 30/1

Size—7.6 feet long by 7.1 feet wide; ca. 6.4 feet high.
Floor—brown clay.
Walls—1 shared with Room 29; 3 single-coursed with buff mortar, undressed stone; monochrome plaster.
Ceiling—split shakes and poles.
Features—D-shaped hearth against wall; 1, probably 2, storage pots set beneath floor.
Use—dwelling.

Room 30/2

Size—probably same as Room 30/1; ? high.
Floor—roof of lower room.
Walls—2 entirely gone; 2 single-coursed with buff mortar, undressed stone; monochrome plaster.
Ceiling—split shakes and poles.
Features—no hearth.
Use—dwelling ?

Room 31

Size—8.2 feet long by 7.7 feet wide; ca. 6.7 feet high.
Floor—clay.
Walls—1 shared with Room 30/1; 2 single-coursed with tan mortar, some pecked stones; 1 double-coursed with tan mortar, some pecked stones; monochrome plaster.
Ceiling—split shakes and poles.
Features—corner hearth; 1 wall peg.
Use—dwelling.

Room 32

Size—ca. 5 feet long by 5 feet wide; ? high.
Floor—blue clay.
Walls—1 shared with Room 33; 1 unmodified bedrock cave wall; 1 entirely gone; 1 double-coursed with buff mortar; monochrome plaster.
Ceiling—unmodified cave roof, possibly with a section of wood and dirt.
Features—none.
Use—storage.

Room 33

Size—6.3 feet long by 6.3 feet wide; 0 to 5.4 feet high.
Floor—tan clay.
Walls—1 unmodified bedrock cave wall; 3 single-coursed with pink mortar, some pecked stones; no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 2 wall pegs; 1 suspension beam.
Use—storage.

Room 34

Size—4.8 feet long by 4.4 feet wide; 0 to 4.1 feet high.
Floor—probably packed dirt or clay.
Walls—1 shared with Room 33; 1 unmodified bedrock cave wall; 2 single-coursed with pink mortar; no plaster.
Ceiling—unmodified cave roof.
Features—1 rectangular doorway; 1 wall loop.
Use—storage.

Room 35

Size—8.6 feet long by 4.2 to 6.2 feet wide; 0 to 7 feet high.
Floor—probably packed dirt or clay.
Walls—1 shared with Room 36/1; 1 shared with Room 34; 1 unmodified bedrock cave wall; 1 double-coursed with red mortar, pecked stones; no plaster.
Ceiling—unmodified cave roof.
Features—1 probable rectangular doorway.
Use—storage.

Room 36/1

Size—5.9 to 7.3 feet long by 5.3 feet wide; ca. 5.6 feet high.
Floor—blue clay.
Walls—1 shared with Room 37/1; 2 single-coursed with brown mortar, a few pecked and chipped-edge stones; 1 double-coursed with red mortar, pecked stones; monochrome plaster on lower part of 1 wall.
Ceiling—wood and dirt.
Features—corner hearth; 1 rectangular doorway; 7 wall pegs.
Use—dwelling.

Room 36/2

Size—same as Room 36/1; 2.6 to 6 feet high.
Floor—roof of lower room.
Walls—4 single-coursed with buff mortar, some pecked stones; no plaster.
Ceiling—half unmodified cave roof, half wood and dirt?
Features—corner hearth; 2 rectangular doorways; 1 wall niche; 6 wall pegs; probable small exterior balcony; narrow shelf; 1 or 3 suspension poles.
Use—dwelling.

Room 37/1

Size—8.8 feet long by 5.7 feet wide; 6.3 feet high.
Floor—probably packed dirt or clay.
Walls—1 large slab-based, multiple-coursed; 3 double- or multiple-coursed with red mortar, pecked stones; monochrome plaster.
Ceiling—split shakes and poles.

Features—no hearth; 2 wall pegs; 1 wall niche.
Remarks—must have been entered through doorway in missing wall.
Use—dwelling.

Room 37/2

Size—9.2 feet long by 6.2 feet wide; ca. 5.6 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 36/2; 1 entirely gone; 2 single-coursed with veneer on interior, pink mortar, undressed stone; monochrome plaster on lower part of walls.
Ceiling—probably twigs and poles.
Features—corner hearth; 8 wall pegs; 1 wall niche; 1 corner shelf; 2 long narrow shelves; probable exterior balcony.
Remarks—must have been entered through doorway in missing wall.
Use—dwelling.

Room 37/3

Size—same as Room 37/2; 0.7 to ca. 2 feet high.
Floor—roof of lower room.
Walls—2 entirely collapsed; 2 single-coursed with buff mortar, undressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—none.
Use—storage.

Room 39

Size—6.8 feet long by 5.2 feet wide; ? high.
Floor—tan clay.
Walls—1 shared with Room 31; 1 entirely gone; 2 single-coursed with tan mortar, undressed stone; no plaster.
Ceiling—entirely gone.
Features—none.
Use—storage?

Room 40/1

Size—6.7 to 7.7 feet long by 5.7 to 6.9 feet wide; ca. 7 feet high.
Floor—2 blue clay surfaces.
Walls—1 shared with Room 37/1; 3 single-coursed with brown mortar, some pecked stones; no plaster.
Ceiling—wood and dirt.
Features—corner hearth; small shelf.
Use—dwelling.

Room 40/2

Size—same as Room 40/1; ca. 6 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 37/2; 2 entirely gone; 1 single-coursed with buff mortar, some pecked stones; no plaster.
Ceiling—wood and dirt.
Features—none.
Use—dwelling.

Room 41

Size—5.5 feet long by 3 feet wide; 0 to 3.3 feet high.
Floor—blue clay.
Walls—1 shared with Room 35; 1 unmodified bedrock cave wall; 1 entirely gone; 1 single-coursed with buff mortar, undressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—none.
Use—storage.

Room 42/1

Size—9.5 feet long by 6 feet wide; 5.3 to 6.2 feet high.
Floor—blue clay.
Walls—1 shared with Rooms 35 and 36/1; 1 shared with Rooms 45/1 and 72; 1 shared with Room 41; 1 single- and double-coursed with buff mortar, undressed stones; monochrome plaster on lower portion of 1 wall.
Ceiling—split shakes and poles.
Features—hearth against wall; 1 T-shaped doorway; access to Rooms 45/1 and 41 through 2 additional doorways; 2 dismantled grinding bins were associated with a lower floor surfaced.
Use—dwelling.

Room 42/2a

Size—ca. 7 to 8 feet long by 6 feet wide; 1.5 to 6 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 36/2; 1 shared with Room 45/2; 1 unmodified bedrock cave wall; 1 entirely gone; monochrome plaster.
Ceiling—unmodified cave roof.
Features—hearth; access through 2 doorways to Rooms 36/2 and 45/2; 2 wall pegs; 1 suspension pole.
Use—dwelling.

Room 42/2b

Size—ca. 4 feet long by 3 feet wide; 1 to 2.3 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 36/2; 1 unmodified bedrock cave wall; 2 entirely gone, marked only by mud lines.
Ceiling—unmodified cave roof.
Features—none.
Use—storage.

Room 44/1

Size—5 to 5.3 feet long by 4.4 to 4.7 feet wide; 3.5 feet (?) high.
Floor—orange clay.
Walls—1 shared with Room 37/1; 1 entirely gone; 2 single-coursed with buff mortar, a few pecked stones; no plaster.
Ceiling—twigs and poles?
Features—none.
Use—?

Room 44/2

Size—6.2 and 8.6 feet long by 5 feet wide; ca. 7.4 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 37/1; part of 1 shared with Room 42/1; 2 entirely gone; 1 single-coursed with buff mortar, undressed stones; no plaster.
Ceiling—wood, juniper bark, and dirt.
Features—4 wall pegs.
Use—dwelling.

Room 45/1

Size—6.2 feet long by 5.2 feet wide; 4.9 to 5.7 feet high.
Floor—tan clay.
Walls—1 entirely gone; 2 single-coursed with tan mortar, some pecked faces; 1 double-coursed with pink mortar, undressed stones; no plaster.
Ceiling—split shakes and poles.
Features—1 rectangular doorway; 2 wall niches; 3 wall pegs; 1 bench.
Use—dwelling.

Room 45/2

Size—6.2 feet long by 6.6 feet wide; 2.9 to 6.6 feet high.
Floor—roof of lower room.
Walls—1 entirely gone; 3 single-coursed with pink and buff mortar, some pecked stones; monochrome plaster.
Ceiling—unmodified cave roof.
Features—corner hearth; 1 rectangular doorway; 3 wall

loops; smoke hole.
Use—dwelling.

Room 46/1

Size—10.6 to 11.8 feet long by 9.4 feet wide; 6 to 7 feet high.
Floor—no floor surface found.
Walls—part of 1 shared with Room 45/1; 1 unmodified bedrock cave wall; 3 single-coursed with buff mortar, some pecked stones; no plaster.
Ceiling—split shakes and poles.
Features—none.
Use—turkey pen.

Room 46/2

Size—9.4 feet long by 5 to 8 feet wide; 2.3 to 5.7 feet high.
Floor—roof of lower room.
Walls—1 shared with Room 45/2; 1 bedrock cave wall; 1 entirely gone; 1 single-coursed with pink mortar; bichrome plaster.
Ceiling—unmodified cave roof.
Features—hearth against 1 wall; bench partly pecked in bedrock wall; smoke hole.
Use—dwelling.

Room 47

Size—7.4 to 9.1 feet long by 4.9 feet wide; ca. 4.2 feet high.
Floor—stone slabs in blue clay.
Walls—1 shared with Room 46/1; 1 unmodified bedrock cave wall; 2 single-coursed with buff mortar, 1 large slab based; monochrome plaster.
Ceiling—wood and dirt.
Features—corner hearth.
Remarks—must have been entered through a doorway in missing part of wall.
Use—dwelling.

Room 48/1

Size—6.9 to 8.1 feet long by 6.1 feet wide; ca. 7 feet high.
Floor—probably packed dirt or clay.
Walls—1 shared with Room 47; 1 unmodified bedrock cave wall; 1 entirely missing; 1 single-coursed with buff mortar, few pecked stones; no plaster.
Ceiling—wood and dirt.
Features—1 doorway.
Use—dwelling.

Room 48/2

Size—6.1 feet long by ca. 4 feet wide; 4.9 + feet high.
Floor—roof of lower room.
Walls—1 shared with Room 51; 3 entirely gone, known only from mud lines.
Ceiling—unmodified cave roof.
Features—none.
Use—dwelling.

Room 49

Size—ca. 7 to 10 feet long by ca. 6 to 7 feet wide; ? high.
Floor—stone slabs in gray clay.
Walls—1 unmodified bedrock cave wall; 3 entirely gone, known only from footings and slumped building stones.
Ceiling—twigs and poles.
Features—probable corner hearth; 1 storage jar set beneath floor.
Use—dwelling.

Room 50

Size—4.6 to 5.5 feet long by 3.2 to 4.5 feet wide; 2.3 to 4.7 feet high.
Floor—packed dirt over unmodified bedrock.
Walls—1 shared with Room 51; 1 unmodified bedrock cave wall; 2 single-coursed with pink mortar, some pecked stones; no plaster.
Ceiling—unmodified cave roof.
Features—no hearth; 2 rectangular doorways; access through a third doorway to Room 51.
Use—storage.

Room 51

Size—6.8 to 8.8 feet long by 3.6 to 4.8 feet wide; 2.1 to 4.9 feet high.
Floor—unmodified bedrock partly covered with packed dirt.
Walls—1 unmodified bedrock cave wall; 3 single-coursed with pink mortar, some chipped-edge and pecked stones; no plaster.
Ceiling—unmodified cave roof.
Features—no hearth; 1 rectangular doorway.
Use—storage.

Room 52

Size—4.7 feet long by 2.5 feet wide; ca. 3 to 4 feet high.
Floor—unmodified bedrock and tan clay.
Walls—1 shared with Room 51; 1 unmodified bedrock cave wall; 1 entirely gone; 1 single-coursed with brown mortar, undressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—no hearth.
Remarks—probably entered through doorway in missing wall.
Use—storage.

Room 53/1

Size—roughly triangular ca. 8 feet on a side; ? high.
Floor—red clay.
Walls—1 shared with Room 49; 1 unmodified bedrock cave wall; 1 entirely gone, known only from mud lines.
Ceiling—probably twigs and poles.
Features—grinding bin.
Use—dwelling ?

Room 53/2

Size—slightly smaller than Room 53/1; ? high.
Floor—roof of lower room.
Walls—1 partly shared with Room 52; 1 unmodified bedrock cave wall; 1 entirely gone, known only from mud lines; monochrome plaster.
Ceiling—unmodified cave roof.
Features—natural bedrock bench.
Use—dwelling ?

Room 54

Size—roughly triangular, 8 feet on 1 side; ? high.
Floor—probably shale-topped bedrock sandstone ledge.
Walls—1 unmodified bedrock cave wall; 2 single-coursed.
Ceiling—unmodified cave roof.
Features—none.
Remarks—built under large sandstone boulder on upper part of trash slope.
Use— storage ? or burial chamber ?

Room 55

Size—6.8 feet long by 4.2 feet wide; 4.5 to 5.8 feet high.
Floor—pink clay.
Walls—1 shared with Room 10; 1 entirely gone; 2 single-coursed with tan and pink mortar; no plaster.
Ceiling—unmodified cave roof.
Features—access through doorway to Room 10/1.
Use—?

Room 56

Size—5.4 feet long by 4.4 feet wide; 5.1 to 5.9 feet high.
Floor—pink clay.
Walls—1 shared with Rooms 10 and 11; 1 shared with Room 13; 1 entirely gone; 1 single-coursed with tan mortar, undressed stones; no plaster.
Ceiling—unmodified cave roof.
Features—none.
Use—?

Room 57

Size—2.8 feet long by 2.5 feet wide; 5 feet high.
Floor—unmodified bedrock.
Walls—1 shared with Room 12/1, 1 shared with Room 15/1; 2 single-coursed and double-coursed with red mortar, undressed stones; no plaster.
Ceiling—split shakes and poles.
Features—probable small doorway through now stabilized north wall.
Use—storage.

Room 58

Size—4.5 feet long by 3.1 feet wide; ? high.
Floor—stone slabs and brown clay.
Walls—1 shared with Courtyard D; 1 shared with Room 66; 1 double-coursed with brown mortar, pecked stones; 1 single-coursed with blue mortar; no plaster.
Ceiling—entirely gone; probably wood and dirt.
Features—two-level floor.
Use—storage.

Room 62

Size—10.4 feet long by 7.6 feet wide; ? high.
Floor—packed dirt.
Walls—3 double-coursed, pecked stones; 1 single-coursed, pecked stones; no plaster.
Ceiling—entirely gone, probably wood and dirt.
Features—1 floor level rectangular doorway; 1 small shelf.
Use—dwelling.

Room 63

Size—8.6 to 10.6 feet long by 7 feet wide; ? high.
Floor—packed dirt.
Walls—1 shared with Room 62; 2 double-coursed, pecked stones; 1 single-coursed, pecked stones; no plaster.
Ceiling—entirely gone, probably wood and dirt.
Features—access through doorway to Room 62.
Use—dwelling.

Room 66

Size—8.8 feet long by 4.5 to 8.2 feet wide; ? high.
Floor—packed dirt.
Walls—1 shared with Room 63; 2 double-coursed with brown and blue mortar, some pecked stones; 1 single-coursed with brown mortar, pecked stones; no plaster.
Ceiling—entirely gone, probably wood and dirt.
Features—corner hearth; 1 posthole; 2 storage jars set beneath floor.
Use—dwelling.

Room 69

Size—3.6 to 8.5 feet long by 4.9 feet wide; ? high.
Floor—roof of lower room.
Walls—1 unmodified bedrock cave wall; 3 entirely gone, known only from mud lines.
Ceiling—entirely gone, probably wood and dirt.
Features—2 pecked figures on cave wall.
Use—storage.

Room 70

Size—3.3 to 4.6 feet long by 2.9 feet wide; 7+ feet high.
Floor—blue clay.
Walls—1 shared with Room 60; 1 unmodified bedrock cave wall; 1 single-coursed with brown mortar, some pecked stones; 1 double-coursed with blue mortar, some pecked stones; no plaster.
Ceiling—wood and dirt.
Features—1 rectangular doorway; 3 sharpening grooves.
Use—storage.

Room 71

Size—roughly triangular, 13 by 11 by 8 feet; ? high.
Floor—packed dirt.
Walls—1 shared with Rooms 60/1 and 70; part of 1 shared with Room 22/1; 1 unmodified bedrock cave wall; 1 single-coursed, pecked stones.
Ceiling—wood and dirt.
Features—oval hearth against cave wall; stone slab table; 2 storage jars set beneath floor; stone block counter or table; access through a doorway to Room 70.
Remarks—possibly a second story; old slab-lined hearth and old floor levels beneath latest floor.
Use—work.

Room 72

Size—7.1 to 10.8 feet long by 5.8 feet wide; 0 to 5.5 feet high.
Floor—probably packed dirt or clay.
Walls—1 shared with Room 45/1; 1 shared with Room 41; 1 unmodified bedrock cave wall; 1 shared with Room 46/1; no plaster.
Ceiling—unmodified cave roof.
Features—1 wall peg.
Remarks—must have been entered through doorway in missing wall.
Use—storage.

Room 73/1

Size—5.6 to 6.5 feet long by 5.5 feet wide; ? high.
Floor—brown clay.
Walls—1 shared with Courtyard B; 1 shared with Room 40/1; 2 single-coursed with blue mortar, undressed stones; no plaster.
Ceiling—wood and dirt.
Features—4 suspension poles.
Remarks—old slab-lined hearth underlies 1 corner; must have been entered through roof.
Use—storage.

Room 73/2

Size—same as Room 73/1; ? high.
Floor—roof of lower room.
Walls—1 shared with Room 40/2; 2 entirely gone; 1 double-coursed with pink mortar, pecked stones; monochrome plaster.
Ceiling—entirely gone, probably wood and dirt.
Features—1 T-shaped doorway.
Use—dwelling.

Room 74/1

Size—ca. 4 feet long by 2.5 feet wide; ca. 4 feet high.
Floor—probably packed dirt or clay.
Walls—3 entirely gone, known only from mud lines; 1 unmodified bedrock cave wall.
Ceiling—entirely gone, probably wood and dirt.
Features—none.
Use—storage.

Room 74/2

Size—ca. 4 feet long by 2.5 feet wide; ca. 3 feet high.
Floor—roof of lower room.
Walls—3 entirely gone, known only from mud lines; 1 unmodified bedrock cave wall.
Ceiling—unmodified cave roof.
Features—none.
Use—storage.

Room 75

Size—2.7 feet long by 2.7 feet wide; ? high.
Floor—red clay.
Walls—1 shared with Room 40/1; 1 shared with Room 44; 2 crushed by rock fall.
Ceiling—twigs and split shakes.
Features—none.
Use—storage.

Room 77

Size—6.5 feet long by 6.3 feet wide; ? high.
Floor—tan clay.
Walls—1 shared with Room 40/1; 3 single-coursed with blue mortar, some pecked stones; no plaster.
Ceiling—split shakes and poles.
Features—no hearth; no doorways.
Remarks—must have been entered through the roof.
Use—dwelling.

Room 78

Size—6.5 feet long by 5 to 6.2 feet wide; ? high.
Floor—gray clay.
Walls—1 shared with Room 77; 3 single-coursed with blue mortar, undressed stones; no plaster.
Ceiling—wood and adobe.
Features—oval hearth in corner; 1 wall niche.
Use—dwelling.

Room 79

Size—ca. 4 feet long by 2.9 feet wide; ? high.
Floor—red clay.
Walls—1 shared with Room 40/1; 1 shared with Room 78; 1 shared with Room 75; 1 entirely gone.
Ceiling—entirely gone, probably wood and adobe.
Features—2 storage jars set beneath the floor.
Use—storage.

Room 80

Size—6 feet long by 4.3 to 5.8 feet wide; ? high.
Floor—probably packed dirt.
Walls—1 shared with Room 77; 2 single-coursed with blue mortar, pecked stones; 1 double-coursed with blue mortar, pecked stones; no plaster.
Ceiling—entirely gone, probably wood and adobe.
Features—none.
Use—?

index

A

Acoma: 246
acorns: 75, 260
Adobe Cave (Site 1228): 6, 22, 24, 39, 40, 41, 44, 47, 50, 68, 70, 87, 90, 92, 94, 95, 100, 113, 114, 131, 175, 231, 234, 245, 246, 262
Alamo Ranch: 1
amaranth (see pigweed)
area
  definition: 43
  description: 61, 62
arthritis: 94, 251
aspen: 251, 255, 260
Awatovi: 209, 210, 215, 248
Aztec Ruin: 232
azurite: 244

B

Balcony House: 55
beans: xii, 97, 98–99, 256, 257, 261
beeplant: 97, 99, 256, 260, 261
bighorn sheep: 6, 219, 221, 224, 229, 250, 255, 257, 261
Big Juniper House: 37
Brinkerhoff, Jack: 16

C

Chaco Black-on-white: 261
Chaco Canyon: 221
Chapin Gray: 25, 188, 190
Chapin Mesa: 50, 55, 67, 70, 102, 146, 257, 260
chipped-edge stone masonry: 19, 20, 44
chokecherry: 50, 226, 252, 255, 260, 261
Cliff House sandstone: 2, 4, 44, 47, 53
Cliff Palace: 40, 102
climate: 6, 256
Cochiti: 104
Colorado Historical Society (Colorado State Museum): 1, 16, 107, 118, 128, 131, 194, 212, 221, 233, 236
community: 31, 39, 40–41, 262
corn (cobs, kernels, husks, etc.): xii, 20, 24, 48, 97–98, 101, 182, 184, 196, 201, 234, 238, 244, 245, 251, 253, 256, 257, 261
Cortez Black-on-white: 187
cotton: 1, 99, 114, 120–122, 124, 125, 126, 236, 257, 261
cottontail: 84, 101, 102, 103, 104, 249, 250, 255, 257, 261, 262
courtyard unit: 31, 35, 37–39, 40, 41

D

deer: 6, 102, 104, 105, 106, 124, 219, 221, 222, 224, 225, 228, 229, 236, 250, 255, 257, 261, 263
dog: 102, 105, 106
double-coursed masonry: 45, 46
Douglas-fir: 6, 34, 36, 50, 72, 82, 255, 256, 257
dual division: 31, 39–41, 242, 262

E

eggshell: 97, 106
elderberry: 52, 56, 255, 260
excavation and stabilization procedure: 6–17

F

farmlands: 40, 41, 99, 257, 261
fauna: 6, 101–106, 255
feces, human: xii, 33, 97, 106, 256, 260

fendlerbush: 5, 6, 50, 226, 252, 255, 260
flora: 5–6, 255–256
fossils: xii, 4, 244, 245

G

geology: 2, 4
Gila Pueblo: 6
Glen Canyon: 148
goosefoot: 97, 256, 260, 261
gourd: 99
greasewood: 36, 56, 252, 255, 260
groundcherry: 97, 256, 260, 261

H

habitation unit: 37–39
Hawikuh: 219
hematite: 74, 93, 128–129, 244, 257
Hopi: 40, 171, 243, 246, 248, 261
household: 31, 35, 36, 37, 41, 262
Hovenweep Corrugated: 133
human hair: 93, 122–124

I

Inaccessible House: 67
insects: 6, 60, 97, 101, 145, 175

J

Jug House (Site 1283): 40, 41
juniper: 5, 33, 34, 35, 36, 49, 50, 52, 56, 72, 77, 100, 228, 252, 255, 256, 257, 261

K

Keres: 40, 41
kihu: 38, 67, 84–86
Kokopelli: 171

L

Laguna Pueblo: 262
Lancaster, James A.: xi, 6, 7, 64, 71
La Plata District: 210
lichen: 255
Long House: xii, 25, 41, 74, 101

M

maize (see corn)
Mancos
  Black-on-white: 20, 25, 26, 179, 186, 189, 190, 191, 250, 251
  Corrugated: 20, 25, 190, 191
Mancos River: 2, 146, 211, 212, 229, 260
Mancos shale: 2, 244
Mason, Charles C.: 1, 16
McElmo Black-on-white: 25, 131, 145–185, 189, 190, 191, 196, 246, 250, 251
McElmo Creek: 2
Menefee formation: 2, 4
Mesa Verde
  Black-on-white: 25, 26, 131, 145–186, 189, 190, 191, 196, 246, 250, 251
  Corrugated: 25, 26, 60, 131ff., 190, 191
Mesaverde group (sandstone and formation): 2, 18, 131, 145, 185, 202, 207, 208, 210, 235, 257
Mesa Verde Museum: 184, 233, 241, 250
Mimbres Black-on-white: 168
miner's lettuce: 97, 255, 256, 260, 261
Moccasin Mesa: 257, 260
mockorange: 5, 33, 50, 52, 107, 251, 252, 255, 260
mountain mahogany: 5, 33, 34, 36, 50, 52, 56, 72, 100, 226, 228, 235, 252, 255, 260
Mug House reservoir (Site 1586): 6, 41, 64, 65, 184, 256, 261

N

Nordenskiöld, Gustaf: 1, 2, 58, 121, 128, 131, 212, 215, 221, 237, 247, 248
Nusbaum, Jesse L.: 6

O

oak: 5, 33, 34, 36, 50, 52, 56, 63, 72, 100, 109, 194, 210, 215, 234, 252, 255, 260
Oak Tree House: 102
One Clan House: 37

P

pecked-face stone masonry: 18, 22, 44–45, 68, 85, 263
Pecos Pueblo: 207, 212, 219, 224, 242
petrified wood: 93, 242, 245, 249, 261
petrographic analysis: 145
pigweed: 97, 99, 253, 256, 260, 261
pinyon: 5, 36, 50, 72, 189, 255, 257, 261
Point Lookout sandstone: 2
pollen: xii, 97, 98, 256
ponderosa pine: 50, 228, 255, 257
population estimate: 37, 262
pottery types and wares
  Chaco Black-on-white: 261
  Chapin Gray: 25, 188, 190
  Cortez Black-on-white: 187
  Hovenweep Corrugated: 133
  Mancos
    Black-on-white: 20, 25, 26, 179, 186, 189, 190, 191,

    250, 251
  Corrugated: 20, 25, 190, 191
 McElmo Black-on-white: 25, 131, 145–185, 189, 190, 191, 196, 246, 250, 251
 Mesa Verde
  Black-on-white: 25, 26, 131, 145–186, 189, 190, 191, 196, 246, 250, 251
  Corrugated: 25, 26, 60, 131ff., 190, 191
 Mimbres Black-on-white: 168
 Red Mesa Black-on-white: 261
 San Juan Red Ware: 261
 St. Johns Polychrome: 188, 261
 Tusayan
  Corrugated: 261
  Black-on-red: 261
  White ware: 261
 White Mountain Red Ware: 261
 Wingate Polychrome: 261
prickly pear: 97, 256, 260, 261
Pueblo Bonito: 221, 248
Pueblo Indians: 17, 67, 68, 97, 106, 121, 128, 188, 235, 241, 242, 244, 245, 246, 253, 256, 260, 263

Q

quarry: 44

R

rabbitbrush: 5, 192, 255, 260
reed: 107, 118, 233, 244, 255, 256, 260
Red Mesa Black-on-white: 261
Reserve-Tularosa design style: 168
Rock Canyon: 2, 4, 6, 40, 41
Rock Springs: 5, 41, 184
Ruin No. 18 (Site 1240): 40, 41
rush: 228, 233, 256

S

sagebrush: 6, 50, 72, 234, 245, 255, 260
saltbush: 33, 52, 100, 107, 252, 255, 260
San Ildefonso: 209
San Juan Red Ware: 261
serviceberry: 5, 32, 33, 34, 35, 36, 50, 52, 54, 56, 72, 77, 85, 100, 234, 251, 252, 255, 260, 262
settlement layout: 31–41, 262
shell: 92, 126, 261
 snail: 2, 92, 128, 257
shrews: 60, 101, 103, 105, 145, 255, 256
Sia Pueblo (Zia): 37, 104, 105, 250, 262
single-coursed masonry: 45, 46
Site 16: 37
Site 1224: 40
Site 1225: 40
Site 1226: 40
Site 1227: 6, 22, 24, 39, 40, 41, 44, 262
Site 1228 (Adobe Cave): 6, 22, 44
Site 1230: xii, 41
Site 1239: 40
Site 1240 (Ruin 18): 40
Site 1243: 41
Site 1283 (Jug House): 40
Site 1586 (Mug House reservoir): 6, 41, 64, 65
skeletal remains: ix, 87–92
  stature estimate: 44, 93, 94
 deformation: 94
skunkbush: 34, 56, 63, 82, 85, 97, 251, 255, 260, 261
soils: xii, 5, 99, 100, 257
Spruce Tree House: 25, 37, 40, 50
Square Tower House: 70, 71
squash: xii, 33, 60, 97, 98, 101, 145, 147, 222, 256, 257, 261
St. Johns Polychrome: 188, 261
stabilization: 6, 46, 47, 48
stratigraphy: 17–18
suite: 31–37
sunflower: 256, 260
Sun Point Pueblo: 37
Sunset House: 102

T

teeth: 95
terraces, farming: 41, 99, 255, 257, 261
Tewa: 40
Tiwa: 40
tobacco: 244, 253
toeholds: 40, 86
topography: 2, 4
tower: 37, 38, 40, 43, 48, 64, 67, 86, 128, 188, 215, 216, 248, 262
trails: 4, 40
tree-ring dating: xii, 6, 19, 21, 24–27, 256, 257, 260
T-shaped doorways: 50–52, 61, 62
Tularosa Black-on-white (see Reserve-Tularosa design style)
tunnel: 72, 75, 76, 77, 78, 86, 237
turkey: x, 72, 79, 102, 103, 104, 105, 106, 113, 118, 125, 128, 222, 224, 225, 229, 250, 257
 pen: 44, 50, 60, 261, 262, 263
 gizzard stone: 60
 droppings: xii, 60
Tusayan
 Corrugated: 261
 Black-on-red: 261
 White ware: 261
Two Raven House: xii, 37

U

unit-type pueblo: 21, 37
University Museum, University of Pennsylvania: 1, 251

V

vegetation: 5, 6, 255–256
veneer: 45, 46

W

water supply: 4, 6, 41, 64–65, 116, 184, 256, 261
weaving (loom loops): 56, 85, 119, 121, 237, 261
  tools: 226–228
Wetherill
  family: 1, 2
  Richard: 1, 221, 251
  John: 1
White Mountain Red Ware: 261
willow: 1, 6, 33, 50, 56, 76, 92, 119, 192, 231, 232, 233, 237, 251, 252, 253, 255, 256, 260
Wingate Polychrome: 261

Y

Yellow Jacket Ruin: 221
yucca: 1, 6, 49, 57, 60, 98, 101, 106, 111, 112, 113, 114–120, 124, 125, 184, 189, 194, 195, 196, 197, 210, 221, 226, 228, 229, 231, 233, 236, 237–239, 245, 248, 250, 251, 253, 256, 257, 260, 262

Z

Zuñi: 103, 172, 242, 243, 248

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